THE INSTITUTE OF THEORETICAL ASTROPHYSICS
UNIVERSITY OF OSLO

SCIENTIFIC REPORT No. 10 (32) OF CONTRACT No. AF 61 (052) – 186

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OSLO, 1961

UNIVERSITETSFORLAGETS TRYKNINGSSENTRAL, OSLO

THE INSTITUTE OF THEORETICAL ASTROPHYSICS
UNIVERSITY OF OSLO

SCIENTIFIC REPORT No. 10 (32) OF CONTRACT No. AF 61 (052) – 186

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by The Staff of the Institute

II. The 200 Mc/s Radio Telescope of the Solar Observatory
by Gunnar Eriksen

III. Frequency Spectra of Solar Noise Storm Bursts in the 200 Mc/s Range
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by Kjell Brekke

VI. Solar Photography in Hα-Light, 1958—59
by The Staff of the Institute

(Reprint of Report No. 12 in the Report Series of
The Institute of Theoretical Astrophysics, Oslo, Norway)

Manuscript completed June 1960

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SOLAR RADIO NOISE REGISTRATIONS ON 200 Mc/s, 1958-59

OBSERVING STATION HARESTUA

by

The Staff of the Institute

METHOD OF TABULATION OF SOLAR RADIO NOISE DATA

Characteristics tabulated are:

1. Median flux density.
2. Variability.
3. Outstanding occurrences.

The method of tabulation is in close agreement with the scheme proposed by the Assembly of Solar Radio Noise Data for the Quarterly Bulletin of Solar Activity (C. W. Allen).

1. MEDIAN FLUX DENSITY

The flux density tabulated is a median, i.e. the value that is exceeded for half the period under consideration. It is measured every two hours by comparing the recorded solar noise with an adjustable noise generator.

The solar contribution to the antenna temperature $T_{\odot}$ is computed by means of the formula

$$T_{\odot} = \frac{258\,(I - I_v)}{I_v + \Delta I - I_k} + 413 - T_{gal} \;.$$

The unit is degrees Kelvin.

In the formula I is the current flowing through the noise generator in order to obtain the median level on the recorder, I_v and I_k are determined by reference measurements of two circumpolar regions in the sky, centered at RA 20^h13^m, $\delta + 41^\circ$ and RA 09^h40^m, $\delta + 41^\circ$, and ΔI is due to the receiver equipment and is measured in connection with the reference regions. The minus sign is used before I_k because the noise received from RA 09^h40^m, $\delta + 41^\circ$ amounts to less than the dummy load noise. The quantity T_{gal} is the contribution due to galactic noise.

Reference measurements are made three times a week.

Taking the antenna properties into account, the flux density F is obtained in the unit $10^{-22}\,\mathrm{w\,m^{-2}(c/s)^{-1}}$,

$$F = \frac{T_{\odot}}{100} \;.$$

Only 3-hour medians and their weighted means are tabulated in the reports.

2. VARIABILITY

The variability is described by the variability index (values 0 - 3). Bursts affecting the variability index are only those of which the intensity is equal to or greater than the median intensity, measured from the median intensity level. A burst n times as great counts as n bursts.

The scale of indices used at present is,

0	0 - 3	bursts per hour
1	4 - 14	" " "
2	15 - 49	" " "
3	50 or more	" " "

Only 3-hour mean indices and their weighted daily means are tabulated.

3. OUTSTANDING OCCURRENCES

Radio events tabulated as outbursts are mainly strong intensity increases of short duration.

Data tabulated are,

a. Starting time
b. Time of maximum intensity
c. Duration
d. Type
e. Peak flux density
f. Smooth intensity

a. Starting Time

If the time of start is not clearly defined on the record, it is taken as the time when the occurrence first reaches 0.2 of its smoothed intensity.

b. Time of Maximum Intensity

The time of maximum intensity is the time when the occurrence reaches its peak intensity. If the time of maximum must be estimated, an x is added to the time given.

c. Duration

The duration of an event is given in minutes with an accuracy of 0.25 min, counting from the start to the end of the outburst. If the time of end is not clearly defined, it is taken as the time when the occurrence again reaches 0.2 of its smoothed intensity.

d. Type

The following symbols are used,

S - Simple rise and fall of intensity

C - Complex rise and fall of intensity

A - Appears to be a part of general activity

D - Distinct from (apparently superimposed on) the general activity

M - Consisting of several peaks separated by undisturbed intervals of relatively long duration

F - Consisting of several peaks separated by short undisturbed intervals

S - Sudden start

e. Maximum Intensity

The maximum intensity is defined as the maximum flux density value of the outburst in units of $10^{-22} w\ m^{-2}(c/s)^{-1}$.

f. Smooth Intensity

The smooth intensity is intended to give a measure of the excess energy emitted at the frequency considered during the occurrence. It is measured from the level that would have been observed in the absence of the outburst, and amounts to the intensity of a hypothetical outburst with constant intensity and the same duration as the real outburst, representing the same total energy. The same unit is used as.for maximum intensity.

4. OBSERVATION TIME

The sun is observed throughout the year, excepting the months of December and January when the altitude of the sun is too low for reliable observations. Records are made from sunrise to sunset, but in our reports the first and the last hour are excluded, as ionospheric absorption and interference by ground reflections introduce a measure of unreliability during those hours. The observations tabulated thus usually amount to two or three hours less than the total observation time.

The effective observation intervals are tabulated, and accidental interruptions are seen from this column. Interruptions of short duration for calibration of the equipment are not tabulated.

The observation and tabulation of solar radio noise data have been done by Messrs. Elgaröy, Brekke and Maltby.

REGISTRATIONS

SOLAR RADIO NOISE

DAILY DATA FEBRUARY 1958

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

	Flux $10^{-22} w\, m^{-2} (c/s)^{-1}$									Variability									Observation time
U.T. / Date	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	
4				10	10				10				1	1				1	0900-1500
5				51	32				42				2	3				3	0900-1500
6				147	129				138										0900-1500
7				164	167				165				0	0				0	0900-1500
8				188	193				190				1	1				1	0900-1500
9				80	59				70				0	1				0	0900-1500
10				15	37				26				1	0				0	0900-1500
11				14	14				14				1	1				1	0900-1500
12				12	11				11				1	1				1	0900-1500
13				13	14				13				0	2				1	0900-1500
14				14	13				13				0	0				0	0900-1500
15				11	11				11				0	0				0	0900-1500
16			11	10	12				11			0	0	0				0	0800-1500
17			11	12	12				12			0	1	0				0	0800-1500
18			12	12	12				12			0	0	1				0	0800-1500
19			13	13	11				12			1	1	1				1	0800-1500
20			12	11	12	11			11			2	0	1	1			1	0800-1600
21			11	11	11	11			11			0	0	0	0			0	0800-1600
22			16	16	17	15			16			1	1	1	2			1	0800-1600
23			15	21	55	36			35			2	2	1	2			2	0800-1600
24			31	34	42	37			37			2	1	1	2			1	0800-1600
25			26	50	55	37			47			2	3	3	2			2	0800-1600
26			215	161	166	152			169			2	2	2	1			2	0800-1600
27			95	108	99	108			103			1	1	1	1			1	0800-1600
28			83	87	95	83			87			0	0	0	0			0	0800-1600

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. FEBRUARY 1958

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		10^{-22} w m^{-2} $(c/s)^{-1}$	
4	1154	1154½x	2	ECD	35	10
"	1323	1324½	5	FCD	270	60
"	1449	1449½	1	ESD	350	100
"	1514½	1515	¾	CD	150	50
5	1225	1227	2½	SA	170	80
9	0842	0842½	2	ESD	580	300
"	1357	1400	4	CD	250	120
"	1414	1420¾	7½	FCD	570	120
10	1105¼		¾	CD	70	27
"	1318	1324½	6¼	FCA	500	150
12	1252	1252¾	1	SD	800	400
"	1453½	1454	1	CD	65	35
18	1049	1049½	1	ESD	50	20
"	1149½	1150	1	ESD	50	15
19	1414	1415	2	ECB	160	60
22	1120½	1121½	1½	ESD	> 45	12

SOLAR RADIO NOISE

DAILY DATA MARCH 1958

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

U.T. / Date	Flux $10^{-22} w\, m^{-2} (c/s)^{-1}$ 0-3	3-6	6-9	9-12	12-15	15-13	18-21	21-24	Day	Variability 0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	Observation time
1			29	33	25	20			28			0	2	1	1			1	0800-1600
2			15	13	12	12			13			0	0	0	0			0	0800-1600
3			10	29	51	52			35			0			0				0800-1500
4			12	13	13	14			13			0	0	0	1			0	0802-1600
5			14	12	12	13			13			0	0	0	0			0	0800-1600
6			11	13	14	15			13			0	0	0	0			0	0805-1600
7					21	22			21					1	1			1	1300-1600
8			65	70	36	30			50			1	1	1	2			1	0800-1600
9			38	38	44	36			39			1	1	1	0			1	0800-1600
10			67	66	58	58			62			0	0	0	0			0	0800-1600
11			32	30	25	21			27			1	2	0	0			1	0700-1600
12			56	39	33	31			40			1	0	0	2			0	0700-1600
13			15	18	18	23			18			0	0	1	1			0	0700-1600
14			21	25	17	15			20			0	0	0	0			0	0700-1600
15			12	12	12	12			12			0	0	0	0			0	0700-1600
16			11	12	11	11			11			0	0	0	0			0	0700-1700
17			10	11	11	10			11			0	0	0	0			0	0700-1700
18			13	17	15	12			14			2	2	0	1			1	0700-1700
19			11	14	24	22			18			0	1	2	2			1	0700-1700
20			77	51	69	76			68			1	1		2			2	0700-1700
21			69	70	60	38			59			2	1	0	1			1	0700-1700
22			24	21	21	22			22			2	2	2	2			2	0700-1700
23			23	53	33	21			33			1	2	1	0			1	0600-1700
24			15	13	14	13			14			1	1	1	0			1	0700-1700
25			27	20	23	23			23			1	0	0	0			0	0700-1700
26			40	37	32	32			34			0	0	0	0			0	0700-1700
27			35	48	35	44			41			0	0	0	0			0	0700-1700
28			67	49	52	39			51			1	0	0	1			0	0700-1700
29			22	47	40	48			38			1	2	2	2			2	0600-1700
30			113	74	32	85			75			3	2	2	2			2	0600-1700
31			16	16	30	16			20			1	3	2	1			2	0600-1700

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES, MARCH 1958

Observing Station Harestua — Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		10^{-22} w m^{-2}(c/s)$^{-1}$	
1	0907	0907½	1	SD	190	80
2	1135	1135	2½	ECD	48	8
"	1138		3½	FSD	> 600	450
3	1012½			CD	> 650	
9	1135	1138½	4½	SD	550	150
"	1433	1433¼	1¼	ESD	210	85
14	1600½	1605	6	CD	95	55
21	0920	0920½	2	SA	650	300
"	1310	1310½	3	ESD	2500	250
23	1002	1006	8½	ECD	1000	400
24	0717½	0719	2	CA	450	200
"	0757½	0759½	2½	ECA	750	120
"	1138	1138¾	1	ESD	650	300
"	1635½	1636½	2½	CD	750	150
25	1413½		1	ECD	375	170
27	1202	1203	1½	CD	550	200
28	1238½	1239	3	ESD	300	125
29	0801	0802	1½	CD	850	450
"	0817½	0818	1	ESD	210	100
31	1718	1718½	1	CD	550	200

SOLAR RADIO NOISE

DAILY DATA APRIL 1958

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretixal Astrophysics, Blindern, Norway

U.T. / Date	Flux 10^{-22} w m^{-2}(c/s)$^{-1}$ 0–3	3–6	6–9	9–12	12–15	15–18	18–21	21–24	Day	Variability 0–3	3–6	6–9	9–12	12–15	15–18	18–21	21–24	Day	Observation time
1			30	33	35	33			33			1	2	1	1			1	0600-1700
2			17	21	18	26			20			1	1	1	1			1	0600-1700
3			13	13	13	14			13			0	0	0	2			0	0600-1245
																			1430-1700
4			11	13	17	16			14			1	0	0	0			0	0600-1700
5			13	13	15	16			14			1	0	0	0			0	0600-1700
6			11	11	12	12			11			0	0	0	0			0	0600-1700
7			23	15	14	14			16			1	1	1	1			1	0730-1700
8			9	10	11	9			10			0	1	2	0			1	0600-1700
9			9	9	13	10			10			1	0	2	1			1	0600-1700
10			11	11	12	12			11			1	0	0	1			1	0600-1800
11		9	9	11	11	10			10		0	1	1	0	0			0	0500-1800
12		9	9	10	11	10			10		0	0	0	0	0			0	0500-1800
13		8	10	10	10	10			10		0	0	0	0	0			0	0500-1800
14		9	11	10	10	10			10		0	0	0	0	0			0	0500-1800
15		9	10	10	10	10			10		0	0	0	0	0			0	0500-1800
16		10	10	10	10	10			10		0	0	0	0	0			0	0500-1800
17		9	10	10	12	12			10		0	0	0	0	1			0	0500-1800
18		13	10	10	10	10			11		3	0	0	0	0			1	0500-1800
19		10	10	10	10	10			10		1	0	1	0	0			0	0500-1800
20		8	8	9	10	10			9		1	0	0	0	0			0	0500-1800
21		9	10	10	10	10			10		0	0	0	1	0			0	0500-1800
22		9	11	11	13	11			11		0	0	0	1	1			0	0500-1800
23		10	12	12	12	12			12		0	1	0	0	0			0	0500-1800
24		11	11	11	11	12			11		0	0	0	0	0			0	0500-1800
25		12	13	12	12	12			12		1	0	0	0	1			0	0500-1800
26		12	12	12	13	13			12		0	0	1	0	0			0	0500-1800
27		10	11	12	13	13			12		0	0	0	0	0			0	0500-1800
28		10	11	14	13	13			12		1	1	1	0	0			1	0500-1800
29		10	12	13	15	18	17		14		1	1	1	1	1	1		1	0500-1900
30		31	31	32	32	18	17		27		0	0	1	0	1	2		1	0400-1300
																			1500-1900

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. APRIL 1958

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity Inst.	Maximum Intensity Smooth
	U.T.	U.T.	Minutes		10^{-22} w $m^{-2}(c/s)^{-1}$	
1	1311½	1312½	1½	CA	350	80
"	1538¼	1539	1¼	SD	700	200
2	0638½	0639	1	ESD	220	40
"	0851	0851¾	1½	CD	750	200
"	1047	1047½	1	ESD	550	150
"	1054½	1055¼	1	SD	600	150
"	1518	1518½	1	CD	100	35
"	1540½	1541	1	CD	160	60
"	1610	1611¾	3	CD	500	60
3	0750	0751	1	ECD	60	20
4	0908½	0911	7	FCD	250	50
"	1642	1642½	1	ESD	60	20
5	0734½	0735	1	SD	120	40
"	1403½	1408x	5½	FSD	50	20
8	1302½	1303	¾	CA	50	15
11	0718	0718½	1	ESD	140	65
"	0821	0823	2	CD	> 700	230
"	0915	0916	3	SD	250	120
"	1114	1115	1½	ESD	700	
"	1140	1140½	1½	ESA	40	20
"	1148		1	SA	40	20
"	1337	1339	3½	CD	150	65
13	1303	1303¼	1½	SD	50	20
16	1358	1358¼	¾	ESD	> 45	20
19	0645	0648	4	CD	450	60
20	0535½	0535¾	1½	ESD	30	
21	0831		1½	ECD	> 45	20
24	1523		6	SD	50	45
29	1154	1154½	1	ESD	370	125
"	1301¼	1304¾	7½	CD	600	120
"	1654	1655	1½	ESD	450	220

SOLAR RADIO NOISE

DAILY DATA MAY 1958

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

	Flux $10^{-22} w\ m^{-2} (c/s)^{-1}$									Variability									Observation time
U.T. / Date	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	
1		16	30	22	19	20	19		21		2	2	1	1	1	2		1	0400-1900
2		13	19	25	31	30	19		23		0	2	2	2	2	2		2	0400-1900
3				17	16	15	14		16				1	1	1	2		1	0830-1900
4		11	13	13	13	13	13		13		0	1	1	1	1	2		1	0400-1900
5		20	21	15	14	31	72		29		2	2	1	1	2	2		2	0400-1900
6		11	13	12	12	12			12		1	1	1	1	1			1	0400-1600
7		9	11	12	12	11	10		11		1	1	1	0	0	0		1	0400-1900
8		9	10	10	10	11	11		10		1	1	1	0	0	0		1	0400-1900
9		10	10	10	10	11	11		10		1	0	0	0	0	0		0	0400-1900
10		9	10	10	10	10	10		10		0	0	0	0	0	1		0	0400-1900
11		9	10	10	10	10	10		10		0	0	0	0	0	0		0	0400-1900
12		10	10	10	10	10	10		10		0	0	0	0	0	0		0	0400-1900
13		9	10	10	10	10	10		10		0	0	0	0	0	0		0	0400-1900
14		10	10	11	11	10	10		10		0	0	0	0	0	0		0	0400-1900
15		10	10	10	10	11			10		0	0	0	0	0			0	0400-1650
16		11	10	10	10	10	11		10		0	0	0	0	0	0		0	0400-1900
17		11	12	13	18	19	16		15		0	1	1	1	2	2		1	0400-1900
18			12	12	12	11	11		12			0	1	1	0	0		0	0805-1900
19		16	14	11	11	10	10		12		1	1	0	0	0	1		1	0400-1900
20		11	11	11	11	11	11		11		0	0	0	0	0	0		0	0400-1900
21		10	10	10	10	10	10		10		0	0	0	0	0	0		0	0400-1900
22		10	10	10	10	10	10		10		0	0	0	0	0	0		0	0400-1000
																			1200-1900
23		10	10	11	11	11	11		11		0	0	0	1	0	1		0	0400-1900
24		11	10	11	11	10	10		10		0	0	0	0	0	0		0	0400-1900
25		11	10	10	10	10	10		10		0	0	0	0	0	0		0	0400-1900
26		10	10	10	11	10	10		10		0	0		0	0			0	0400-0800
																			0900-1900
27		11	11	10	12	10	10		11		0	1	0	0	0	0		0	0400-1900
28		11	10	10	10	10	10		10		0	0	0	0	0	1		0	0300-1900
29		11	10	10	10	9	9		10		0	0	0	0	0	0		0	0300-1500
																			1715-1900
30		10	10	10	10	10	9		10		0	0	0	1	0	0		0	0300-1900
31		9	9	9	9	9	10		9		0	0	1	0	0	1		0	0300-1900

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. MAY 1958

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		10^{-22} w m^{-2}(c/s)$^{-1}$	
1	1751	1751 ½	1	ESD	430	200
6	0614	0614 ¼	1	ESD	65	30
13	0707 ½	0708 ½	2	SD	270	120
"	1619	1620 ½	3½	ECD	600	250
17	1027½	1028 ½	2	SD	120	50
"	1350 ¾		1¾	CD	250	120
"	1354 ¼	1354 ½	1	SD	150	70
18	1924	1924 ½	1½	ESD	250	120
19	1828¼	1829 ½	1¾	SD	320	150
21	0624½	0624 ½	¾	ESD	50	40
"	0809 ½	0809 ¾	½	ESD	450	200
25	0526 ½	0527	1	SD	50	20
27	1059	1059 ½	1	ESD	170	80
30	1512	1513	1½	SD	80	30
31	0650	0651	1½	ECD	250	80

SOLAR RADIO NOISE

DAILY DATA JUNE 1958

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

U.T. / Date	Flux 10^{-22} w m^{-2}(c/s)$^{-1}$ 0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	Variability 0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	Observation time
1		10	10	10	10	9	9		10		0	0	0	0	0	1		0	0300-1900
2		9	9	10	10	10	10		10		0	0	0	1	0	1		0	0300-1900
3		9	9	10	10	9	8		9		0	0	0	0	0	0		0	0300-1900
4				10	10	10	10		10				0	0	0	1		0	0945-1900
5		10	9	10	10	10	9		10		1	0	0	0	0	0		0	0300-1900
6		9	10	11	11	11	15		11		1	1	2	2	2	3		2	0300-1900
7		21	22	25	23	16	13		21			1	1	1	2	1		1	0300-1900
8		11	12	13	13	12	12		12		1	1	1	1	1	1		1	0300-1900
9		13	13	13	13	12	12		13		1	0	1	0	0	0		0	0300-1900
10		12	12	10	10	9	8		11		0	1	0	1	1	1		1	0300-1900
11		10	9	9	9	10	10		9		0	0	0	0	0	0		0	0300-2000
12		11	11	14	11	10	10		11		0	0	1	0	0	0		0	0300-2000
13		9	10	9	10	9	10		9		0	0	0	0	0	0		0	0300-1245
																			1500-2000
14		8	8	8	10	9	9		9		0	0	0	0	1	0		0	0300-2000
15		10	10	10	10	9	10		10		0	0	0	0	0			0	0300-2000
16		10	10	10	10	9	10		10		0	0	0	0	0	0		0	0300-2000
17		10	10	9	10	9	9		10		0	0	0	0	0	0		0	0300-2000
18		9	10	10	10	10	10		10		0	0	0	0		0		0	0300-2000
19		10	10	12	12	10	10		11		0	0	0	0	0	1		0	0300-2000
20		11	14	10	9	9	9		10		0	2	2	0	0	0		1	0300-2000
21		10	9	9	9	9	9		9		1	0	0	0	0	0		0	0300-2000
22		8	12	10	10	8	9		10		2	2	2		0	0		1	0300-2000
23		8	9	9	9	9	9		9		0	0	0	0	0	0		0	0300-1700
																			1745-1900
24		9	8	9	9	9	9		9		0	0	0	0	0	0		0	0300-1900
25		11	12	13	17	18	18		14		1	1	2	2	2	2		2	0300-1900
26			34	25	20	16	15		22			1	0	1	0	0		0	0715-1900
27		15	12	13	13	13	12		13		0	0	0	0	0	0		0	0300-1900
28		11	11	11	12	17	17		13		0	0	0	0	1	1		0	0300-1900
29		11	11	10	11	10	11		11		1	1	0	1	0	0		1	0300-1715
																			1800-1900
30		11	9	10	9	10	9		10		0	0	0	0	0	0		0	0300-1900

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. JUNE 1958

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		10^{-22} w m^{-2}(c/s)$^{-1}$	
5	0841 ½	0843	38	FCD	330	45
"	1618	1624	16	SD	55	15
"	1705 +	1717	> 26	CD	160	45
6	0433	0457½	38	FCD	225	50
"	1035	1036	3	ESD	150	70
28	1844½	1845	1	ESD	250	110
30	0615	0616	1½	ECD	> 45	15

+ Uncertain.

SOLAR RADIO NOISE

DAILY DATA JULY 1958

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

	Flux 10^{-22} w m^{-2}(c/s)$^{-1}$									Variability									Observation time
U.T. / Date	0 3	3 6	6 9	9 12	12 15	15 18	18 21	21 24	Day	0 3	3 6	6 9	9 12	12 15	15 18	18 21	21 24	Day	
1		10	11	12	11	9			11		1	1	1	0	0			1	0300-1645
2		13	14	17	30	34	24		22		2	0	1	1	0	1		1	0300-1900
3		43	39	34	30	27	27		34		1	1	2	2	1	1		1	0300-1900
4				38	33	22	15		29				1	1	1			1	0900-1900
5		12	15	13	18	20	22		16		1	1	2	3	3	3		2	0300-1900
6		22	40	32	32	26	28		30		2	2	1	2	2	3		2	0300-1900
7		13	11	11	11	11	9		11		0	0	0	1	1	1		0	0300-1900
8		9	9	10	8	9	8		9		0	0	0	0	0	0		0	0400-1900
9		10	11	13	12	11	11		11		0	0	0	0	0	0		0	0400-1900
10		10	11	10	11	10	10		10		0	0	0	0	0	1		0	0400-0900
																			1100-1900
11		11	18	14	13	12	12		13				1	1	2	2		1	0400-1900
12		15	21	33	50	27	24		30		1		0	1	1	2		1	0400-1900
13		25	28	35	44	53	38		38		1	1	0	0	0	1		0	0400-1900
14		25	26	26	26	23	24		25		0	0	1	1	0	1		0	0400-1900
15		14	15	14	14	18	14		15		1	0	1	1	2	1		1	0400-1900
16		21	22	15	16	13	12		17		3	2	1	1	1	1		1	0400-1900
17		32	42	36	24	17	17		29		2		1	1	2	2		2	0400-1900
18		13	14	16	15	12	12		14		0	2	2	1	1	1		1	0400-1000
																			1045-1900
19		16	13	12	12	20	31		15		2	2	0	1	1	2		1	0400-1900
20		19	18	20	25	18	16		20		1	0	1	1	1	1		1	0400-1900
21		22	19	17	16	20	22		19		1	1	0	1	2	2		1	0400-1900
22		21	20	21	20	13	12		18		0	1	1	0	2	1		1	0400-1900
23		10	11	11	16	19	19		14		0	0	1	2	2	2		1	0400-1900
24		39	34	30	63	47	42		43				1	1	1	1		1	0400-1900
25		25	25	19	23	21	19		22		2	0	1	1	1	1		1	0400-1900
26		14	14	13	12	11	11		13		0	0	0	0	0	0		0	0400-1900
27		17	19	19	23	24	26		21		1	1	1	1	1	1		1	0400-1900
28		26	26	26	29	30	25		27		1	1	1	1	1	1		1	0400-1900
29		108	65	30	25	17	17		43				1	1	0	0		1	0400-1900
30		12	12	12	15	14	12		13		1	1	1	1	1			1	0400-1900
31		14	17	16	15	15	16		16		2	1	2	2	2	2		2	0400-1900

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. JULY 1958

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		10^{-22} w m^{-2}(c/s)$^{-1}$	
1	0352 ½	0353	1	ESD	>45	15
2	0658	0658 ½x	¾	ESD	>55	20
"	0936	0936 ¾	1	SD	>55	20
3	0908 ½	0909x	2¾	CD	> 100	50
5	1429 ¼	1429 ¼	4½	CA	210	35
"	1615 ¾	1616 ½	1	SA	>45	15
"	1716 ½	1717 ¼	1¾	CA	>45	10
7	1737	1737	1	ESD	40	10
9	1943	1944x	3	ESD	>35	10
10	0730 ½	0731	1	ESD	60	25
"	1027	1028 ½	2	ESD	80	30
11	0555	0556 ½x	2	ESD	> 220	100
"	0723 ½	0725x	2	ESD	> 220	100
"	1118 ½	1120 ½	3½	CD	220	70
"	1253	1254 ½	2½	CD	350	150
"	1609	1610	1½	ESD	> 550	200
"	1803	1805	2	FCA	250	50
12	0756	0757 ½	3	ESA	450	150
13	1723	1723 ½	¾	ESD	160	50
14	1825 ½	1826	1	SD	140	40
15	0807 ½	0807 ½	½	ESD	160	50
18	0516	0518	4	CD	60	20
"	0959	0959 ¼	¾	SA	450	200
"	1003 ¼	1003 ½x	1¾	CA	300	80
"	1606 ½	1607x	1	SD	>60	20
"	1720 ¼	1721	5	CD	>60	10
19	1905 ½	1908x	8½	CA	> 350	180
23	1146 ½	1147x	3½	ECD	>30	10
"	1253	1325	63	CD	70	10
25	0400 ¾	0401	½	ESD	> 175	75
"	0429 ½	0429 ¾	½	ESD	175	75
26	0856 ½	0857	1	ESD	400	190
"	1657 ½	1658 ¼	1½	SD	>35	12
27	0524 ½	0526	2½	SD	> 550	200
"	0855 ½	0857 ½	3½	CD	300	100
"	1308 ½	1309x	1¼	CD	220	80
"	1851 ½	1851 ¾	½	SD	320	130
28	0612 ½	0613x	1	SA	350	100
"	1745	1745 ½	1½	SA	150	40
31	1130	1130 ½	¾	ESD	300	140
"	1251	1251 ½x	¾	ESD	> 800	300
"	1530 ¾	1531	¾	ESD	> 800	300

SOLAR RADIO NOISE

DAILY DATA AUGUST 1958

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

	Flux 10^{-22} w m^{-2}(c/s)$^{-1}$									Variability									Observation time
U.T. / Date	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	
1		16	24	15	15	15	14		17		2	1	1	2	2	2		2	0400-1900
2		12	14	13	15	11	11		13		2	2	2	3	1	1		2	0400-1900
3		12	11	10	11	13			11		1	1	0	0	1			1	0400-1800
4		10	9	10	11	10			10		1	0	0	0	0			0	0400-1800
5		9	10	9	10	9			9		0	0	0	0	0			0	0500-1800
6		8	9	11	13	12			11		0	0	1	2	1			1	0500-1800
7		18	22	17	17	21			19		3	3	2	2	3			3	0500-1800
8		11	12	13	12	11			12		2	2	2	2				2	0500-1800
9		11	11	12	14	14			13		1	1	1	1	2			1	0500-1800
10		32	27	18	23	30			25			1	2	2	3			2	0500-1800
11		18	18	18	23	18			19		2	1	1	1	2			1	0500-1800
12		37	18	22	36	35			28		0	0	0	1	1			0	0500-1800
13		19	77	35	33	78			53			1	1	1	2			1	0500-1800
14		25	22	22	15	18			20		1	1	1	0	1			1	0500-1800
15		13	17	13	14	56			24		0	0	0	1				0	0500-1800
16				31	18	12			17				0	0	1			0	1100-1800
17		11	12	15	15	13			14		0	1	2	1	2			1	0500-1800
18		11	15	23	14	10			15		0	0	0	1	1			0	0500-1800
19		9	11	10	9	8			9		1	2	1	2	0			1	0500-1800
20		14	12	11	10	10			11		2	1	1	1	0			1	0500-1800
21		12	16	22	27	32			22		1	1	2	1	1			1	0500-1800
22			44	42	37	186			77			0	0	0	0			0	0600-1800
23			81	79	67	49			69			0	0	0	0			0	0600-1800
24			25	22	22	17			21			1	1	1	1			1	0800-1800
25			20	17	21	21			20			0	0	1	0			0	0600-1800
26			39	42	39	25			37			0	0	0	0			0	0600-1700
27			22	15	14	12			16			1	1	1	1			1	0600-1700
28			12	11	9	9			10			0	1	0	0			0	0600-1700
29			10	11	15	22			14			0	0	1	1			0	0800-1700
30			51	39	59	47			49			2	1	2	0			1	0800-1700
31			50	25	20	25			30			3	2	3	3			3	0600-1700

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES, AUGUST 1958

Observing Station Harestua, Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		$10^{-22} w\, m^{-2} (c/s)^{-1}$	
2	1615¼	1615¼	½	ESD	> 55	20
"	1842¾	1844x	5	ECD	>650	250
4	1218+		> 1½	CD	> 35	20
"	1225	1225½	¾	SD	> 35	10
"	1229	1229½	1	SD	85	35
6	0624½	0625	1¾	SD	> 35	15
8	1821½	1822	2	CA	300	100
9	0626	0627	3½	SD	180	80
10	1506	1508½	4½	CA	200	45
11	1059¾	1100¼	1	SD	160	70
"	1753¾	1754	1	ESD	800	350
12	0635½	0636x	¾	SD	> 85	35
"	1632	1632¾x	1½	SA	150	75
17	0507	0507½	2	SD	40	15
23	1312	1312½	1	ESD	750	350
27	1600¼	1600¾	1	ECD	>600	200
28	1024½	1039	22½	CD	250	40
31	1337¾	1338¼	¾	SA	250	120

+ Uncertain

SOLAR RADIO NOISE

DAILY DATA SEPTEMBER 1958

Observing Station Harestua . Frequency 200 Mc/s.

The Institute of Theoretical Astrophysics, Blindern, Norway

U.T.	Flux $10^{-22} W m^{-2} (c/s)^{-1}$									Variability									Observation time
Date	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	
1			20	18	20	26			21			1	2	2	2			2	0600-1700
2			23	13	15	33			20			2	1	2	3			2	0600-1700
3			26	22	21	16			22			3	3	2	1			3	0600-1500 1600-1700
4			13	12	12	11			12			1	0	0	0			0	0600-1700
5			10	10	11	11			10			0	0	1	1			0	0600-1700
6			11	9	13	8			10			0	0	0	0			0	0600-1700
7			9	9	8	8			9			0	0	0	0			0	0600-1700
8			9	9	9	9			9			0	0	0	0			0	0600-1700
9			9	9	8				9			0	0	0				0	0600-1500
10			12	10	9	9			10			1	0	0	0			0	0600-1700
11			9	10	10	9			10			0	0	0	1			0	0600-1700
12			10	10	10	9			10			0	0	0	0			0	0600-1700
13			11	15	11	9			12			0	0	0	0			0	0600-1700
14			10	12	11	9			11			0	0	0	0			0	0600-1700
15			12	10	10	10			11			0	0	0	0			0	0600-1700
16			9	9	10	11			10			0	0	0	1			0	0600-1700
17			9	19	10	10			12			1	0	0	0			0	0600-1700
18			13	11	10	10			11			0	0	0	0			0	0600-1700
19			11	10	9	10			10			0	0	0	0			0	0600-1700
20			18	11	10	10			12			0	0	0	0			0	0600-1700
21			9	9	10	11			10			0	0	0	1			0	0600-1700
22			15	22	10	10			15			1	1	0	0			1	0600-1600
23			9	9	9	9			9			0	0	0	0			0	0700-1600
24			9	9	9	9			9			0	0	0	1			0	0800-1600
25			9	9	9	10			9			0	0	0				0	0800-1600
26			9	9	9	9			9			0	0	0	1			0	0700-1600
27			9	9	8	8			9			0	0	0	0			0	0700-1600
28			9	9	9	9			9			0	0	0	0			0	0800-1600
29			9	9	10	10			9			0	0	0	0			0	0700-1600
30			10	10	10	9			10			0	0	2	1			1	0700-1600

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. SEPTEMBER 1958

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		$10^{-22} w\, m^{-2} (c/s)^{-1}$	
7	1450	1453½	4¾	CD	90	30
9	1146½	1147	1¼	SD	320	~ 150
11	1220½	1221½	3½	CD	40	15
12	0658	0659¼	3	SD	100	~ 40
"	0854½	0855¼	¾	ESD	~ 550	270
14	0855	0906	36	CD	115	~ 30
"	1233½	1235	3¾	CD	~ 550	50
18	1016½	1017	1½	CD	75	30
24	1513	1514½	2	CD	140	~ 40
28	1047½	1050½	3½	SD	280	~ 30
30	1501½	1504	3½	ECD	450	60

SOLAR RADIO NOISE

DAILY DATA OCTOBER 1958

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

U.T. / Date	Flux 10^{-22} w m^{-2} $(c/s)^{-1}$ 0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	Variability 0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	Observation time
1			10	9	9	9			9			1	0	0	0			0	0700-1600
2			9	10	10	11			10			0	1	1	2			1	0700-1600
3 *)			9	10	9	9			9										0700-1600
4			34	22	12	10			20			2	2	0	0			1	0700-1600
5			9	9	9	9			9			0	0	0	0			0	0700-1600
6					9	9			9					1	0			0	1300-1600
7			9	9	9	9			9			0	0	0	0			0	0700-1600
8			10	10	10	10			10			0	0	0	1			0	0700-1600
9			9	10	10	10			10			0	0	0	0			0	0700-1600
10			10	10	10	10			10			0	0	0	0			0	0700-1600
11			10	10	10	10			10			0	0	0	0			0	0700-1600
12			10	10	10	10			10			0	0	0	0			0	0700-1600
13			9	10	10				10			0	0	0				0	0800-1500
14			9	9	9				9			0	0	0				0	0800-1500
15			9	9	9				9			0	0	0				0	0800-1500
16			9	9	10				9			0	0	0				0	0800-1500
17			10	10	10				10			0	0	0				0	0800-1500
18			12	13	14				13			1	1	1				1	0800-1500
19			19	16	15				16			1	1	1				1	0800-1500
20			10	12	12				12			0	2	2				2	0800-1500
21			13	13	12				13			1	2	0				1	0800-1500
22			12	11	10				11			1	2	1				1	0800-1500
23			9	10	10				10			0	1	0				0	0800-1500
24			9	10	11				10			1	0	1				1	0800-1500
25			9	9	9				9			0	0	0				0	0800-1500
26			9	9	9				9			0	0	0				0	0800-1500
27			9	10	10				10			0	0	0				0	0800-1500
28			52	42	59				51			2	2	2				2	0800-1500
29 *)																			
30			19	25	21				22			2	2	2				2	0800-1500
31			12	13	10				12			1	1	2				1	0800-1500

*) Lokal noise disturbances.

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. OCTOBER 1958

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		10^{-22} w m^{-2}(c/s)$^{-1}$	
8	1528½	1531	4½	CD	170	70
9	1038¼	1038½	1½	SD	>35	10
9	1453		5	FED	>35	
14	1053½	1055½	5½	CD	130	30
19	1309	1309¾	1¾	SA	130	50
22	1301½	1302½	1½	CD	250	~ 100
22	1432	1432¾	1½	SD	150	50
22	1445½	1443 x	4	CD	500	200
24	0932	0932½	1	CD	110	~ 20
24	1132	1133	1½	CD	150	60
24 *)	1442 x	1501	about 35	CD	240	~ 100

*) End of eruption uncertain due to ground reflections just before sunset.

SOLAR RADIO NOISE

DAILY DATA NOVEMBER 1958

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

	Flux $10^{-22} w m^{-2} (c/s)^{-1}$									Variability									Observation time
U.T. / Date	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	
1			10	12	18				14			1	1	1				1	0800-1500
2				10	11				10				0	1				0	0900-1500
3			11	10	10				10			0	0	0				0	0800-1500
4			18	12	10				12			1	0	1				1	0807-1500
5			12	11	10				11			0	0	0				0	0800-1500
6																		No observations	
7																		"	"
8																		"	"
9																		"	"
10																		"	"
11																		"	"
12																		"	"
13																		"	"
14				10	11				10				0	0				0	0900-1400
15				11	10				11				0	0				0	0900-1400
16				10	11				10				0	0				0	0900-1400
17				11	10				11				0	0				0	0900-1400
18				10	10				10				0	0				0	1000-1400
19				11	10				11				0	0				0	0900-1400
20				10	10				10				0	0				0	0900-1400
21				10	10				10				0	0				0	0900-1300
22				10	11				10				0	1				0	0900-1400
23				12	13				12				0	0				0	0900-1300
24				14	14				14				0					0	0900-1400
25				16	15				16				1	0				1	0900-1400
26				11	10				11				0	0				0	0900-1400
27				42	14				31				2	2				2	0900-1400
28				15	16				15				2	2				2	0900-1400
29				55	27				44				2	2				2	0900-1400
30				17	16				17				2	2				2	0900-1300

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES, NOVEMBER 1958

Observation Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		$10^{-22} w\, m^{-2} (c/s)^{-1}$	
5	1015½	1017	2	CD	450	200

SOLAR RADIO NOISE

DAILY DATA FEBRUARY 1959

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

	Flux $10^{-22} w\, m^{-2} (c/s)^{-1}$									Variability									Observation time
U.T. / Date	0 3	3 6	6 9	9 12	12 15	15 18	18 21	21 24	Day	0 3	3 6	6 9	9 12	12 15	15 18	18 21	21 24	Day	
1				10	10				10				0	0				0	0900-1400
2				10	10				10				0	0				0	0900-1500
3				12	10				11				0	0				0	0900-1500
4				10	10				10				1	0				0	0900-1500
5				10	9				9				0	0				0	0900-1500
6				9	9				9				0	0				0	0900-1500
7				13	12				12				1	1				1	0900-1500
8				38	16				27										0900-1500
9				26	92				59				0						0900-1500
10				45	46				45				1	2				2	0900-1500
11				36	39				37				0						0900-1400
12				22	24				23				0	0				0	1000-1500
13				21	16				17				2	1				1	1100-1500
14				36	26				31				1	3				2	0900-1500
15				118	92				105				0	0				0	0900-1500
16				34	33				34				1	1				1	0900-1500
17				18	14				16				1	2				1	0900-1500
18				10	11				10				0	0				0	0900-1500
19				10	9				9				0	0				0	0900-1100 1200-1500
20			10	9	10				10			0	0	1				0	0800-1400
21			13	17	12	9			14			2	3	1	0			2	0800-1600
22			13	11	10	10			11			1	1	0	0			0	0800-1600
23				10	10	10			10				0	1	2			1	1000-1600
24			11	12	9	9			10			0	0	2	2			1	0800-1600
25			13	12	11	10			11			1	1	0	1			1	0800-1600
26			13	11	10	10			11			1	0	1	1			1	0800-1600
27			20	14	12	11			13			2	1	0	0			1	0800-1600
28			12	11	11	9			11			2	0	1	1			1	0800-1000 1100-1600

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. FEBRUARY 1959

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		10^{-22} W m^{-2}(c/s)$^{-1}$	
17	1154¼	1154½	¾	SA	> 190	~100
17	1416	1416½	1	SA	> 190	~100
18	1032½	1033 x	1¼	SD	> 135	~ 60

SOLAR RADIO NOISE

DAILY DATA MARCH 1959

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

	Flux 10^{-22} W m^{-2} $(c/s)^{-1}$									Variability									Observation time
U.T. / Date	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	
1			9	9	11	11			10			0	0	2	2			1	0800-1600
2			11	10	11	10			10			0	0	1	0			0	0800-1600
3			9	9	9	9			9			0	0	0	0			0	0800-1600
4			11	10	10	10			10			0	0	0	0			0	0815-1600
5			8	8	10	10			9			0	0	0	0			0	0800-1600
6			10	10	10	10			10			0	0	0	0			0	0800-1600
7			10	10	10				10			0	0	0				0	0800-1400
8			12	11	11	13			11			1	1	0	2			1	0800-1600
9			11	12	13	11			12			0	1	1	0			1	0800-1600
10			10	11	10	10			10			0	0	0	0			0	0800-1600
11			11	10	10	10			10			0	0	0	0			0	0800-1600
12			11	21	14	10			15			0	1	2	0			1	0800-1700
13			11	12	12	11			12			0	0	0	0			0	0700-1700
14			10	10	10	10			10			0	0	0	0			0	0800-1700
15			11	11	11	10			11			0	1	0	0			0	0700-1700
16			10	10	11	9			10			1	0	0	0			0	0800-1700
17			10	11	11	10			11			0	0	0	0			0	0800-1700
18			11	10	12	11			11			1	0	1	1			1	0800-1700
19			38	22	16	12			20			3	1	3	0			2	0800-1000 1400-1700
20			14	18	19	58			25			1	2	2				2	0700-1700
21			38	22	17	14			26			1	1	1	1			1	0600-1700
22			19	26	22	24			23			1	1	1	1			1	0600-1700
23			23	17	17	14			18			2	2	2	0			2	0600-1700
24			36	112	35	30			58			0	0	1	1			0	0600-1700
25			16	19	21	20			19			1	1	2	2			1	0600-1700
26			16	17	15	14			16			1	2	1	1			1	0600-1700
27			68	69	113	119			90			2	2	3	3			2	0600-1700
28			53	26	24	23			34			2	3	2	1			2	0600-1700
29			18	22	21	27			22			2	2	3	2			2	0600-1700
30			68	58	72	46			62			2	2	2	3			2	0600-1700
31			37	26	18	14			25			2	3	2	3			2	0600-1700

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES, MARCH 1959

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		10^{-22} w m^{-2}(c/s)$^{-1}$	
1	1224	1224½ x	1	SD	> 135	~ 60
1	1433½	1434¼ x	1	SD	125	55
8	1149	1149¾	8	CD	> 160	25
11	1134	1137 x	8	CD	> 135	~ 30
17	1217	1217¾	1	SD	120	~ 50
25	0848¾	0849¼	1	SD	~ 130	55
26	1224½	1225	¾	ESD	> 130	~ 60
29	1259¼	1300 x	1¾	SA	140	35
29	1426½	1426¾	2	SA	170	30
31	1336	1336½	1	SD	~ 300	115

SOLAR RADIO NOISE

DAILY DATA APRIL 1959

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

U.T. Date	Flux 10^{-22} w m^{-2}(c/s)$^{-1}$ 0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	Variability 0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	Observation time
1				11	10	10			10				1	1	0			1	0900-1700
2			10	9	9	9			9			0	0	0	0			0	0600-1700
3			9	9	9	9			9			0	0	0	0			0	0600-1700
4			12	11	12	10			11			1	0	1	0			1	0600-1700
5			10	10	11	10			10			0	0	0	1			0	0600-1700
6			12	14	14	12			13			1	1	0	0			1	0600-1700
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14	No observations																		
15																			
16																			
17																			
18																			
19																			
20																			
21																			
22			9	11	11	10			10			0	1	0	0			0	0600-1800
23		9	9	10	10	10			10		0	0	0	0	0			0	0500-1800
24				9	10	9			9				0	0	0			0	0900-1800
25		10	12	19	26	15			17		0	0	1	1	1			1	0500-1800
26		8	9	9	9	9			9		0	1	0	0	1			0	0500-1800
27		9	9	8	9	9			9		0	0	0	0	1			0	0500-1800
28		8	9	10	14	12			11		0	1	1	1	1			1	0500-1800
29		11	14	12	11	12			12		1	2	2	1	1			1	0500-1800
30		11	10	11	11	12			11		2	1	1	1	1			1	0500-1800

SOLAR RADIO NOISE

OUTSTANDING OCCURRANCES. APRIL 1959

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		$10^{-22} w\, m^{-2} (c/s)^{-1}$	
5	1638½	1641	4	CD	85	20
22	1110½	1116½	9½	CD	110	~ 20
27	1635	1635½	1	ESD	> 35	15
28	0638	0638½	1½	SD	110	~ 40

SOLAR RADIO NOISE

DAILY DATA MAY 1959

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

	Flux $10^{-22} w\,m^{-2}(c/s)^{-1}$									Variability									Observation time
U.T. Date	0 3	3 6	6 9	9 12	12 15	15 18	18 21	21 24	Day	0 3	3 6	6 9	9 12	12 15	15 18	18 21	21 24	Day	
1		11	12	14	11	13			12		1	2	1	2	1			1	0500-1800
2		9	9	9	9	9			9		0	0	0	0	0			0	0500-1800
3		9	9	9	9	10			9		0	0	0	0	0			0	0500-1800
4		8	9	10	9	10			9		1	0	0	0	0			0	0500-1800
5		9	11	10	11	10			10		0	0	0	0	2			0	0500-1800
6		8	9	10	11	9			10		0	0	0	1	0			0	0500-1800
7		12	15	17	19	19			17		0	0	1	1	1			1	0500-1800
8		14	15	13	11	10			12		1	1	1	1	0			1	0500-1800
9		11	11	11	12	11			11		0	1	2	2	1			1	0500-1800
10		16	16	22	21	18			19		2	1	1	2	2			2	0500-1800
11		45	43	41	34	29			37		0	0	0	0	0			0	0500-1800
12		22	25	23	19	19			21		0	1	2	1	1			1	0400-0730 0920-1405 1452-1800
13		26	23	17	14	15	13		18		1	0	1	1	1	0		1	0400-1900
14		14	13	13	13	13	10		13		0	0	0	0	0	0		0	0400-1900
15		8	10	9	10	9	9		9		0	0	0					0	0400-1900
16		11	11	10	10	9			10		0		1						0400-0730 0900-1628
17		8	8	8	10	9	9		9		1	0	0	0	0	0		0	0400-1900
18		9	9	9	9	9			9		0	0	0	0	0			0	0400-1600
19			8	9	9	9	8		9			0	0	0	0	0		0	0700-1045 1145-1900
20		9	9	9	10	9	10		9		0	0	0	0	0	0		0	0400-1900
21		10	10	11	11	11	11		11		0	0	0	0	0	0		0	0400-1900
22		10	10	9	9	9	9		9		0	0	0	0	0	0		0	0400-1900
23		11	11	11	11	13	16		12		1	0	0	1	1	2		1	0400-1704 1730-1900
24		13	12	11	12	9	9		11		1	2	1	2	0	1		1	0400-1900
25		9	9	8	8	8	8		8		2	1	0	0	0	0		0	0400-1900
26		10	11	12	12	11	9		11		0	2	2	2	2	1		2	0400-0815 0836-1025 1040-1447 1522-1900
27		10	13	16	16	11	11		13		0	2	3	2	2	0		2	0400-1900
28		9	10	12	14	11	10		11		0	0	1	1	0	1		0	0400-1900
29		12	10	11	10	10			10		1	0	1	1	0			1	0400-1800
30		12	11	12	13	13	13		12		1	0	0	0	0	1		0	0400-1900
31		15	16	14	16	14	14		15		1	1	1	1	0	0		1	0400-1900

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. MAY 1958

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum intensity Inst.	Maximum intensity Smooth
	U.T.	U.T.	Minutes		$10^{-22} w\ m^{-2} (c/s)^{-1}$	
2	1417½	1417½ x	¾	ESD	> 25	~ 8
8	0542		½	ESA	200	
9	0809	0811	3½	CA	> 100	~ 15
-"-	1147	1148	2	SA	> 130	~ 60
-"-	1232		7	CA	> 130	35
-"-	1518		2	CA	> 130	40
-"-	1715		> 4½	CA	> 130	
13	0511½	0608	90	CD	220	60
14	1337½	1340 x	4	CD	> 170	
16	0919½	0922 x	5	SD	> 100	~ 40
17	0359½	0401½ x	4	CD	90	40
-"-	0526		7	ECD	> 90	~ 90
18	0409	0410 x	2	SD	90	40
-"-	0625	0626	2	SD	90	40
21	1402½	1403½	1½	SD	110	40

SOLAR RADIO NOISE

DAILY DATA JUNE 1959

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

	Flux $10^{-22} w\ m^{-2} (c/s)^{-1}$									Variability									Observation time
U.T. / Date	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	
1		9	10	11	10	10	10		10		0	0	2	1	0	1		0	0400-0900 1100-1900
2		18	18	17	12	11	9		15		2	2	2	1	0	0		1	0400-1900
3		10	10	10	10	10	10		10		0	0	0	0	0	0		0	0400-1900
4		10	10	10	13	13	10		11		1	1	1	2	2	1		1	0400-1900
5		18	13	10	10	10	10		12		2	1	0	0	0	0		0	0400-1900
6		13	14	14	12	11	12		13		0	0	0	0	0	0		0	0400-1900
7		12	11	11	11	11	11		11		0	0	0	0	1	1		0	0400-1900
8		11	11	10	11	9	9		10		0	0	0	0	1	1		0	0400-1900
9		12	213	55	18	16	13		63		0	0	0	2	1	0		1	0400-1900
10		12	12	11	11	11	11		11		0	0	0			1		0	0400-1900
11		10	10	10	10	9	10		10		1	1	0	0	0	1		0	0400-1900
12		10	11	10	10	9	9		10		0	1	0	0	0	0		0	0400-1900
13		10	10	10	10	11	11		10		0	0	0	0	0	0		0	0400-1900
14		10	10	10	10	11			10		0	0	0	0	0			0	0400-1800
15		No observations																	
16		13	12	12	12	12			12		1	1	1	1	0			1	0400-1800
17		12	11	10	11	10			11		0	1	1	0	0			0	0400-1800
18		13	18	15	13	11			14		2	2	2	2	2			2	0400-1800
19		12	12	17	14	13			14		1	1	1	1	1			1	0400-1800
20		12	11	11	11	11			11		0	0	0	0	0			0	0400-1800
21		12	12	12	13	14	14		13		0	0	0	1	1	1		0	0400-1900
22		11	11	10	10	10			10		1	0	0	1	0			0	0400-1800
23		11	12	14	13	23	24		15		0	0	1	0	1	2		1	0400-1900
24		62	36	20	12	12			28		2	1	1	2	1			1	0400-1800
25		11	11	9	12	10			11		0	0	0	2	0			0	0400-1800
26		14	12	11	11	10			12		0	0	1	0	0			0	0400-1000 1100-1200 1415-1800
27		11	12	13	15	15			13		1	2	2	2	2			2	0400-1800
28		61	42	16	16	11			28		3	3	3	2	2			3	0400-0900 1000-1800
29		12	12	14	14	16			14		0	0	1	1	1			1	0400-1800
30		11	13	12	12	12			12		0	0	0	0	0			0	0400-1800

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES, JUNE 1959

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		$10^{-22} w\ m^{-2} (c/s)^{-1}$	
5	1746½	1747	2½	CD	130	25
8	0716½	0721½	5½	CD	240	10
9	~ 0500	0700 x	~ 420 x	CD	> 235	~ 130
9	1651	1702	31	CD	~ 60	~ 20
16	0847½	0848	1½	SA	150	~ 70
16	1010	1010¾	2½	SA	110	~ 50
19	1444	1444½	1	SA	150	65
19	1624½	1625	1¼	SD	> 240	~ 110
20	1753½		3	FCD	> 240	75
25	0712	0721	75	CD	135	4
29	1000		27	CD	55	20
29	1327½	1329	2½	SD	70	25

SOLAR RADIO NOISE

DAILY DATA JULY 1959

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

	Flux $10^{-22} w\, m^{-2} (c/s)^{-1}$									Variability									Observation time
U.T. / Date	0 3	3 6	6 9	9 12	12 15	15 18	18 21	21 24	Day	0 3	3 6	6 9	9 12	12 15	15 18	18 21	21 24	Day	
1		12	11	11	11	11	10		11		0	0	0	0	0			0	0400-1900
2		10	10	10	9	10	10		10		0	0	0	0	0	0		0	0400-1900
3		10	10	10	10	9			10		0	0	0	0	0			0	0400-1800
4		10	11	11	10	10	9		10		0	1	1	0	1	1		1	0400-1900
5		11		11	11	11	9		11		1		1	1	1	1		1	0400-0630 1000-1900
6		12	11	11	12	11	12		11		0	0	0	0		0		0	0400-1900
7		13	12	11	10	10	10		11		1	0	0	0	0	0		0	0400-1900
8		10	10	11	11	10	11		10		0	0	0	0	0	0		0	0400-1900
9		10	10	10	10	9	10		10		0	0	1	0	0	0		0	0400-1900
10		16	10	10	10	10	9		10		0	0	0	0	0	0		0	0400-1900
11		10	10	10	10	10	11		10		0	0	0	0	0			0	0400-1900
12		17	16	14	17	14	14		15			1	2	2	1	1		1	0400-1900
13		12	12	11	12	11	10		12		2	1	0		0	0		0	0400-1900
14		>170	200	176	109	48	36		132			0	0	0	0	0		0	0400-1900
15		15	17	12	11	9	9		12		0	2	1	2	1	1		1	0400-1900
16		11	10	10	10	11	10		10		0	1	0	0	2	0		1	0400-1900
17		20	13	10	9	9	8		10		0	0	0	0	0	0		0	0400-1900
18			11	10	11	11	11		11			2	1	1	1	1		1	0705-1900
19		12	12	13	13	11	11		12		2	1	1	1	0	0		1	0400-1900
20		11	11	11	11	10	10		11		1	0	0	0	0	0		0	0400-1900
21		11	11	11	11	10	10		11		0	0	0	0	0	0		0	0400-1900
22		10	10	10	10	10	10		10		0	0	0	0	0	0		0	0400-1900
23			No observations																
24						10	10		10										1500-1900
25		10	10	11	23	9	9		13		0	0	1	0	0	0		0	0400-1900
26		9	10	9	9	9	9		9		0	0	0	0	0	0		0	0400-1900
27		9	10	10	10	9	9		10		0	0	0	0				0	0400-1900
28		10	10	10	10	10	9		10		0	0	0	0	0	0		0	0400-1900
29		12	13	13	19	16	16		15		0	0	0	0	0	0		0	0400-1900
30			43	44	59	48	45		50			1	0	0	0	0		0	0800-1900
31		47	50	44	34	25	20		38		0	0	0	0	0	0		0	0400-1900

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. JULY 1959

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity Inst.	Maximum Intensity Smooth
	U.T.	U.T.	Minutes		10^{-22} w m^{-2}(c/s)$^{-1}$	
4	1356	1357	1½	SD	30	10
6	1117	1117½	½	SD	30	10
6	1443	1444½	2½	ESD	70	30
7	0342½	0345	3¾	FCD	> 180	60
7	1034	1036½	2	SD	> 180	60
8	1339¼	1340½	5	MSD	100	6
9	1946	1949	4	FCD	100	20
12	1136	1136¼	½	SA	> 60	20
12	1234	1235	1½	SA	60	20
12	2021½	2022	½	ESD	> 60	20
13	1948½	1951	3	CD	55	30
14	1334½	1335¼	1½	SD	> 450	100
14	1735 x	1736¼	2 x	CA	200	50
14	1831	1831¼	½	SD	> 100	20
14	2010 x	2010¾	1½ x	SA	350	100
15	0931½	0933	2	CD	90	25
15	1927	1927½	¾	ESD	150	50
16	1614½	1617 x	4	CD	> 200	> 50
16	1628¼	1629¼	1¼	CA	140	50
18	0736¼	0738	2¼	FCA	> 220	15
18	0808½	0809	3½	FSA	100	10
18	1047½	1048½	1½	SD	170	60
20	1617½	1619	2¼	CD	35	10
25	0549¾	0552	3½	MSD	75	20
26	0751¾	0753	2¼	CD	> 170	50
26	1709¾	1714½	5	MSD	80	15
27	0923¾	0924	1½	ESD	> 40	15
31	1253¾	1253¾ x	½	ESD	> 150	75

SOLAR RADIO NOISE

DAILY DATA AUGUST 1959

Observing Station Harestua Frequency 200 Mc/s
The Institute of Theoretical Astrophysics, Blindern, Norway

U.T. / Date	Flux $10^{-22} \text{w m}^{-2} (\text{c/s})^{-1}$ 0–3	3–6	6–9	9–12	12–15	15–18	18–21	21–24	Day	Variability 0–3	3–6	6–9	9–12	12–15	15–18	18–21	21–24	Day	Observation time
1		13	12	12	12	13	15		13		0	0	0	0	1	2		1	0400-1213- 1215-1900
2		11	12		11	11	11		11		0	0		0	0	0		0	0400-0700 1310-1900
3		10	12		12	11	11		11		1	1		1	0	1		1	0400-0800 1230-1900
4		10	11	11	11	11	11		11		0	0	0	0	0	1		0	0400-1900
5		9	11	11	10	10	10		10		0	0	0	0	0	0		0	0500-1900
6		11	12	10	11	11			11		2	1	1	0	1			1	0500-1800
7		10	11	11	12	11			11		0	0	1	1	2			1	0500-0900 1100-1800
8		10	11	12	12	11			11		2	2	2	2	2			2	0500-1800
9		10	11	11	11	11			11		1	1	0	1	0			1	0500-1800
10		10	11						11		0	0						0	0500-0900
11		11	11	11	11	11			11		0	0	0	0	0			0	0500-1800
12		10	12	11		11			11		1	0	1		0			0	0500-1300 1500-1800
13		9	13	13	13	11			12		1	1	1	2	1			1	0500-1500 1600-1800
14		9	11	11	11	11			11		0	0	0						0500-1000 1200-1600
15			10	10	10	10			10			0	0	0	0			0	0600-1800
16			11	10	10	12			11			1	1	1	2			1	0600-1800
17			11	12	14	13			12			1	1	1	2			1	0600-1800
18			13	71	47	27			40			1	1	1	1			1	0600-1700
19			10	10	10	10			10			0	1	1	1			1	0600-1800
20			13	12	11	12			12					0	0				0600-0800 1000-1800
21			11	11	9	10			10			0	0	0	0			0	0600-1800
22			10	10	11	11			10			0	0	0	0			0	0600-1800
23			14	17	18	20			17			0	0	0	0			0	0600-1800
24			37	38	46	34			39			1	1	1	0			1	0600-1800
25			142	160	171	188			163			0	0	0	0			0	0600-0715 0748-1700
26			125	124	135	142			131			0	0	0	0			0	0600-1800
27																			
28			45	47	43	46			45			1	0	1	0			0	0700-1800
29			181	101	111	309			175			0	0	0	0			0	0600-1800
30			197	132	102	87			133			0	0	0	0			0	0600-1700
31			38	53	32	24			38			1	1	1	1			1	0600-1700

S O L A R   R A D I O   N O I S E

OUTSTANDING OCCURRENCES. AUGUST 1959

Observing Station Harestua.   Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		$10^{-22} w\, m^{-2} (c/s)^{-1}$	
6	0905¼	0905¾	2	FSD	> 700	~ 180
"	0936¾	0937	½	ESD	~ 400	~ 30
"	1135	1135¼	1	ESD	270	55
"	1206	1206¼	½	ESD	440	55
"	1328½	1328¾	½	ESD	140	~ 30
"	1524	1526x	3	CD	> 700	~ 250
"	1532½	1534	1¾	CD	85	30
"	1603	1603½	½	ESD	280	45
"	1611¼	1611½x	¾	CD	35	15
"	1730¼	1731¼	1½	ECD	700	250
7	1118	1118¼	¾	SD	140	~ 60
8	0652½	0654	2	CA	160	60
"	1040	1041	3	FCA	160	~ 40
"	1202	1202½x	1¼	SA	280	130
9	0419½	0420	¾	SD	> 200	100
12	0839½	0843	4	FSD	> 600	150
15	1457½	1459	6½	MSD	> 600	100
16	0643½	0646	3	FCD	330	100
"	0833	0834	1½	SD	200	60
"	0925½	0926	1½	SD	> 600	~ 250
"	1244	1248	5	MSD	> 600	~ 50
17	0714		7½	ECD	> 1000	~ 300
"	1218½	1220	7½	MSD	1200	~ 350
18	0806¾	0808	2	CD	350	170
"	1025	1032½	11	CD	4800	~ 1500
19	1755½	1756½	1¾	CD	> 500	250
20	0605	0606	1	CD	70	25
21	1131	1134	7	MSD	500	25
"	1447¾	1448½	1½	FSD	~ 600	~ 40

SOLAR RADIO NOISE

DAILY DATA SEPTEMBER 1959

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

U.T. / Date	Flux $10^{-22} w\, m^{-2} (c/s)^{-1}$ 0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	Variability 0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	Observation time
1			46	36	31	40			38			1	1	1	0			1	0600-1700
2			52	44	52	26			45			0	0	0	0			0	0600-1700
3			28	45	80	28			47			1	0	0	0			0	0600-1700
4			14	14	18	20			16			0	1	1	1			1	0600-1700
5 *																			
6			12	10	10	12			11			0	0	1	1			0	0600-1000 1300-1700
7			9	10	10	10			10			0	0		0			0	0600-1700
8			10	10	10	10			10			0	0	0	0			0	0600-1700
9			14	11	10	10			11			2	1	0	0			1	0600-1700
10			14	14	16	14			14			1	1	2	2			1	0600-1100 1400-1700
11			17	15	61	34			33			2	2	1	1			1	0600-1700
12				13	13	13			13				1	1	1			1	0900-1700
13			15	20	17	16			17			2	2	2	2			2	0600-1700
14			12	11	10	10			11			1	1	0	1			1	0600-1700
15			12	19	13	11			14			0	0	0	1			0	0700-1700
16 *																			
17 *																			
18 *																			
19			9	10	10	10			10			1	1	0	0			1	0600-1700
20			10	10	11	14			11			0	1	1	2			1	0700-1600
21			12	10	11	10			11			1	0	0	0			0	0700-1600
22			10	10	10	9			10			0		0	0			0	0700-1100 1200-1600
23			12	11	11	11			11			1	0	2	3			1	0700-1600
24 *																			
25			10	11	10	10			10			0	0	1	0			0	0700-1600
26			10	10	10	10			10			0	0	0	0			0	0700-1600
27			11	11	10	10			10			0	0	0	0			0	0800-1600
28 *																			
29 *																			
30 *																			

*) Man made interference.

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. SEPTEMBER 1959

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		$10^{-22} w\, m^{-2} (c/s)^{-1}$	
2	1605	1610	9	CD	~ 1500	360
13	1007½	1008	1	SA	~ 400	200
13	1320½	1322	2½	ECD	~ 400	100
23	1206	1206½	1	SD	> 30	10
23	1456	1503	~ 7	CD	> 30	5
25	1445		3	CD	~ 35	10

SOLAR RADIO NOISE

DAILY DATA OCTOBER 1959

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

U.T. / Date	Flux $10^{-22} w\, m^{-2} (c/s)^{-1}$ 0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	Variability 0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	Observation time
1			10	10	10	10			10			0	0	0	0			0	0700-1600
2																			Interference
3			10	10	10	10			10			0	0	0	0			0	0700-1600
4																			Interference
5			10	10	10				10			0	0	0				0	0700-1300
6																			Interference
7																			Interference
8			10	10	10				10			0	0	0				0	0700-1500
9			10	10	10	10			10			0	0	0	1			0	0700-1600
10			11	10	11	11			10			0	0	0	0			0	0700-1600
11			10	10	10	10			10			0	0	0	0			0	0800-1600
12			10	10	10	10			10			0	0	0	0			0	0800-1600
13			10	10	10	10			10			0	0	0	0			0	0800-1600
14			10	9	10	10			10			0	0	1	1			1	0800-1600
15			22	15	15	15			16				1	3	2			2	0800-1600
16			21	24	50	46			36			2	2	3	3			3	0800-1600
17			14	16	17				16				1	3	2			2	0800-1500
18			11	10	10				10			0	0	0				0	0800-1500
19																			Interference
20			13	11	12				12			1	1	2				1	0800-1500
21			12	11	11				11			1	1	0				1	0800-1100 1300-1500
22			12	11	12				12			0	0	1				0	0800-1500
23			10	10	10				10			0	0	0				0	0800-1000 1300-1500
24			13	12	11				12			0	0	0				0	0800-1500
25			12	12	12				12			1	1	1				1	0800-1500
26			10	12	11				11			0	1	1				1	0800-1100 0300-1500
27			12	12	12				12			0	0	0				0	0800-1500
28			16	15	11				14			3	2	1				2	0800-1100 1400-1500
29			9	9	9				9			0	1	0				0	0800-1400
30			11	11	11				11			0	0					0	0800-1100 1300-1400
31			13	13	13				13			1	1	2				1	0800-1400

SOLAR RADIO NOISE

OUTSTANDING OCCURRANCES. OCTOBER 1959

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		10^{-22} w m^{-2} $(c/s)^{-1}$	
14	1239½	1240	1	SD	210	100
16	0806½	x0807½	8	CA	> 80	30
"	0919	0922	3½	CA	> 80	20
"	1103½		½	SA	140	60
24	1121	1121½	1	SD	80	30
26	0936½	0937½	2	SD	80	20
"	0953	0953½	1	SD	110	50
27	1257½	1258½	1½	SD	> 200	80
"	1357	1357	1	SD	> 200	80

SOLAR RADIO NOISE

DAILY DATA NOVEMBER 1959

Observing Station Harestua Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

U.T.	Flux $10^{-22} w\, m^{-2} (c/s)^{-1}$									Variability									Observation time
Date	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Day	
1				10	10				10				0	0				0	0900-1300
2			15	33	25				27			1	3	3				3	0800-1400
3			20	12	12				13			2	1	1				1	0800-1400
4			17	13					14			1	2					2	0800-1050
5			10	10	10				10			0	0	0				0	0800-1350
6			12	19					17			1	2					2	0800-1050
7				11	11				11				0	0				0	0900-1400
8				14	14				14				2	2				2	0900-1400
9				10	10				10				0	0				0	0900-1050 1300-1400
10				18	41				27				3	3				3	0900-1400
11				9					9										0900-1100
12				11	10				11				2	0				1	0900-1300
13				29	37				32				3	3				3	0900-1050 1300-1400
14				14	15				15				1	0				0	1100-1400
15				12	11				12				1	1				1	0900-1300
16				15	13				14				1	1				1	0900-1045 1300-1400
17				17	15				16				1	2				1	0900-1300
18				16	39				24				1	1				1	0900-1150 1300-1400
19				20	13				16				2	2				2	0900-1100 1200-1400
20				20	20				20				2	2				2	0900-1100 1300-1400
21				14	15				14				1	1				1	0900-1400
22				22	21				22				1	2				1	0900-1400
23				22	25				23				1	0				1	0900-1400
24				27	21				25				1	0				1	0900-1400
25				23					23				1					1	1000-1100
26				52	42				47				1	1				1	1000-1400
27				14	16				15				1	1				1	1000-1100 1200-1300
28																			Interference
29																			Interference
30																			Interference

SOLAR RADIO NOISE

OUTSTANDING OCCURRENCES. NOVEMBER 1959

Observing Station Harestua. Frequency 200 Mc/s

The Institute of Theoretical Astrophysics, Blindern, Norway

Date	Starting time	Time of max.	Duration	Type	Maximum Intensity	
					Inst.	Smooth
	U.T.	U.T.	Minutes		10^{-22} w $m^{-2}(c/s)^{-1}$	
3	1304	1304½	1	SD	110	~ 40
22	1249	1250	2	CA	190	30

THE 200 Mc/s RADIO TELESCOPE OF THE SOLAR OBSERVATORY

by

Gunnar Eriksen

THE 200 Mc/s RADIO TELESCOPE OF THE SOLAR OBSERVATORY, HARESTUA

by

Gunnar Eriksen

ABSTRACT: The antenna, receiver and recording equipment of the 200 Mc/s radiometer used since 1956 for the detection of solar radio noise at the Solar Observatory, Harestua, are described.

1. INTRODUCTION

Registration of solar radio noise on 200 Mc/s has been a part of the scientific program at the Solar Observatory, Harestua since early 1954. The annual period of continuous operation has been from February 1 to November 30. The reason for the mid-winter shutdown is that the altitude of the sun, even at meridian passage, is less that 10 degrees during the months of December and January. The registrations are thus heavily distorted by reflections from the hilly ground. From February through November, however, reliable observations are made during daily periods ranging from a few hours in winter to 18 hours or more during summer months.

The receiving equipment described in the following was put into operation in the fall of 1956.

2. EQUIPMENT

The large Würzburg antenna of the radiometer is shown in Figure 1. It is provided with an equatorial mounting. The radio-frequency part of the receiver is placed in a small instrument hut close to the antenna. The major part of the equipment is housed in the field laboratory as shown in the block diagram of Figure 2. In order to preserve receiver gain stability it is important to keep the equipment at a constant temperature. The ambient temperature in the small hut is stabilized by means of a contact thermomenter controlling the electric heating and a ventilator.

The hour angle of the antenna is controlled from the laboratory by means of the mechanism shown in Figure 3. A small 1,500 r.p.m. synchronous motor is geared to the main gear-box of the antenna. At a mains frequency of 50 c/s the antenna makes exactly one revolution in 24 hours. For quick adjustments a 0.3 h.p. three-phase motor turns the antenna at a rate of one revolution in 6 minutes. This motor is controlled by a switch and a relay operating in series with an electromagnet, releasing the gear from the synchronous motor. A simple synchro-system shows the position of the antenna in hour angle. The declination of the paraboloid is set by hand.

The focal device consists of a dipole and parasitic reflector parallel to the declination plane. Although the focal point lies in the plane of aperture, there is some spill-over effect as a result of the cardoid pattern of the primary feed in the plane of the hour angle. The magnitude of this "lost radiation" has not been evaluated, but it is obvious that the tabulated solar flux values are too low by a constant factor determined by the loss.

A new focal device has been constructed. The installation has been postponed, however, so as to avoid the introduction of uncertainties with respect to antenna gain in an analysis of the variations in the base level of solar noise during the present sunspot cycle.

The signal from the focal device is fed to the receiver by flexible coaxial cable and a coaxial rotary joint (General Radio 874 J) through the hour angle axis.

A motor-driven capacity switch (Figs. 4 and 5) alternately connects the receiver input to the antenna terminal and to a dummy resistor at room temperature at a rate of 73 c/s. For calibration purposes the antenna may be replaced by a saturated diode noise generator by means of a coaxial relay. The coaxial relay, as well as the noise diode current, is controlled from the laboratory.

The r.f. section of the receiver is shown in Figure 6. Three cascaded triode stages are connected in grounded grid fashion. The input coil L_1 is made of copper tubing of 1/8 inch outside diameter. The heater current for the first tube is introduced through an insulated wire inside the copper tube. The anode circuit coils L_2, L_3 and L_4 are self-supporting, and the resonant frequency is adjusted by means of small (2 to 6 $\mu\mu$F) ceramic trimmers. Ch_1 and Ch_2 are bifilarly wound self-resonant chokes. Frequency conversion takes place in a simple crystal mixer. The receiver noise factor is 4 (6 db).

The low-impedance output from a single i.f. amplification stage centered at 30 Mc/s feeds a 70 ohm coaxial cable leading to the main i.f. amplifier in the laboratory. To avoid frequency drifts with resulting impedance misalignment of the antenna and capacity switch, the local oscillator (Fig. 7) is crystal controlled. The output circuit of the local oscillator is made up of a capacity-loaded coaxial resonator.

The major part of the amplification takes place in the main i.f. amplifier (Fig. 8). This amplifier has a bandwidth of 1 Mc/s between half-power points.

At low antenna elevations the registration of solar noise on 200 Mc/s is occasionally disturbed by interfering signals from a television transmitter in sight of the observatory, 20 miles to the south. The transmitter operates on 182.25 - 187.75 Mc/s. The lack of steepness of the i.f. band-pass curve results in appreciable response at the T.V. frequency. A new i.f. amplifier using a double-tuned transformer interstage coupling will give higher skirt selectivity. Additional wavetraps in the r.f. and i.f. circuits are intended to remove the disturbing signals.

The low-frequency part of the receiver is shown in Figure 9.

The output signal from the second detector contains information about the antenna temperature in the form of a voltage that alternates at a rate of 73 c/s between a value corresponding to the output from the dummy resistor and a value corresponding to the antenna temperature. The 73 c/s difference voltage is passed through a twin-T amplifier which removes second harmonic switching transients. A four-diode ring demodulator is biased by a 50 volt, 73 c/s reference voltage from a photocell, the illumination of which is chopped by an extra blade on the capacity switch rotor. A balanced D.C. amplifier feeds a 0 - 5 mA Esterline-Angus recorder.

As the recording equipment is unmanned the greater part of the day, it is important to have some means of automatically increasing the full-scale range of the recorder to avoid loss of information in cases of sudden enhancement of the flux level. The bottom left of Figure 9 shows details of an automatic gain reduction unit. A moving coil relay in series with the recorder operates when the recorder current exceeds 4.9 mA. The change-over contact of relay M charges a 100 μF capacitor across relay B. After a delay of 8 to 10 seconds the voltage across B allows this relay to operate.

Contact B closes the circuit for relay C controlling relay R which increases the input attenuation of the amplifier by a predetermined amount (usually 10 or 20 db).

Relay C further starts a 1/5 r.p.m. timing motor, and relay E takes over the function of relay C. After 5 minutes the timing motor has returned to its original position and releases relay E, thus removing the additional attenuation.

If the flux level is still too high for normal gain, B operates anew after 8 to 10 seconds, and attenuation is increased for another 5-minute interval. A marker pen on the recorder is deflected as long as gain is reduced.

The gain reduction unit can be operated by means of a hand switch for purposes of calibration. The delay of relay B may be checked by means of SW2. Appreciable delay is necessary to avoid operation of the gain reduction unit triggered by off-scale bursts. After each burst the capacitor across B discharges slowly through a 100 k resistor, thus preserving part of the charge from one burst to the next one in case of frequent off-scale bursts. If off-scale bursts are very numerous the preservation of charge will allow B to operate and connect the additional attenuation.

The stabilized D.C. power supplies shown in Figures 10 and 11 are of conventional design.

The mains voltage is stabilized by means of a Philips 2 kVA A.C. stabilizer.

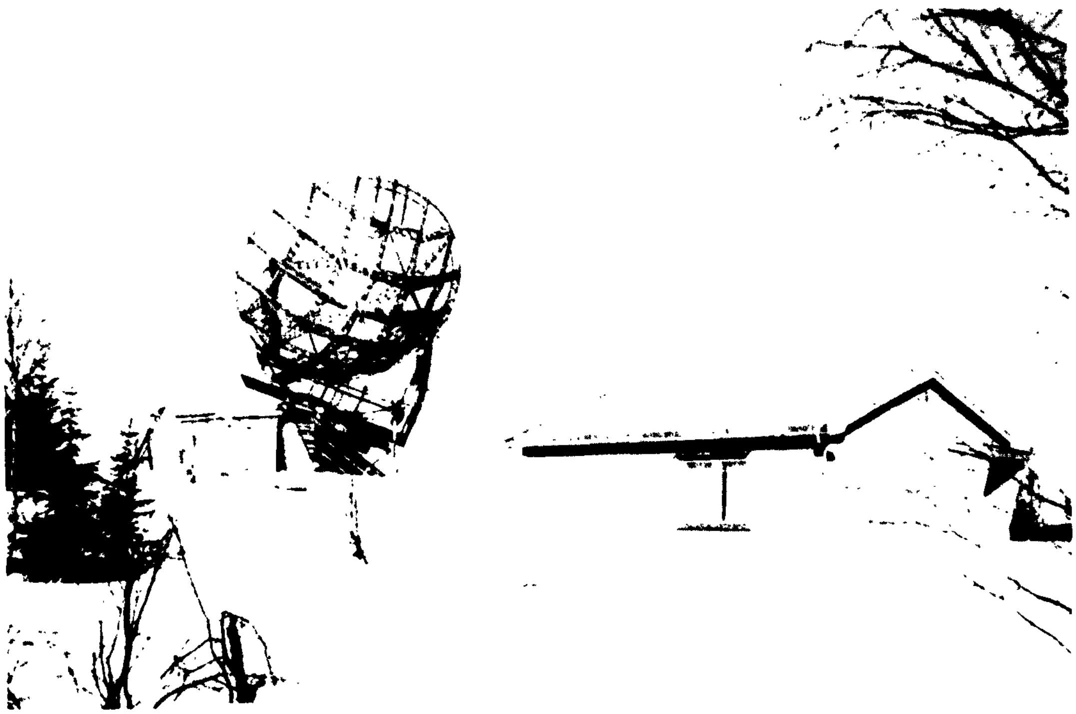


Fig. 1. Würzburg antenna of the Oslo Solar Observatory at Harestua.

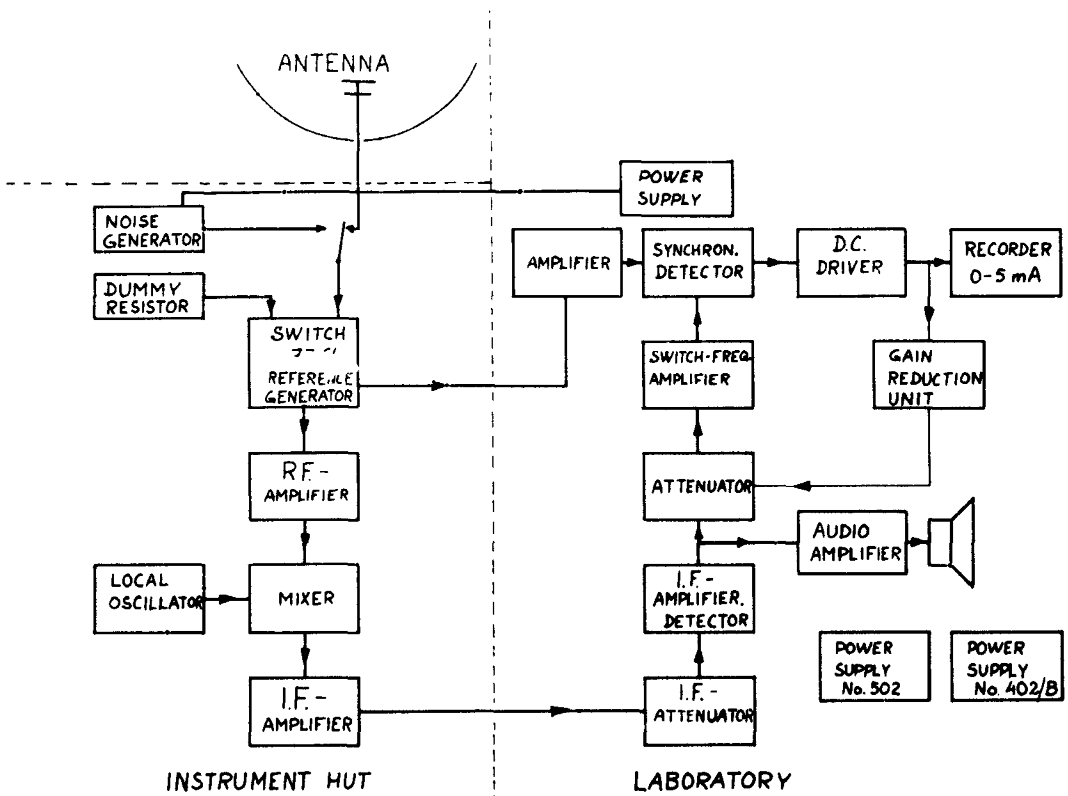


Fig. 2. Block diagram of the 200 Mc/s radio telescope.

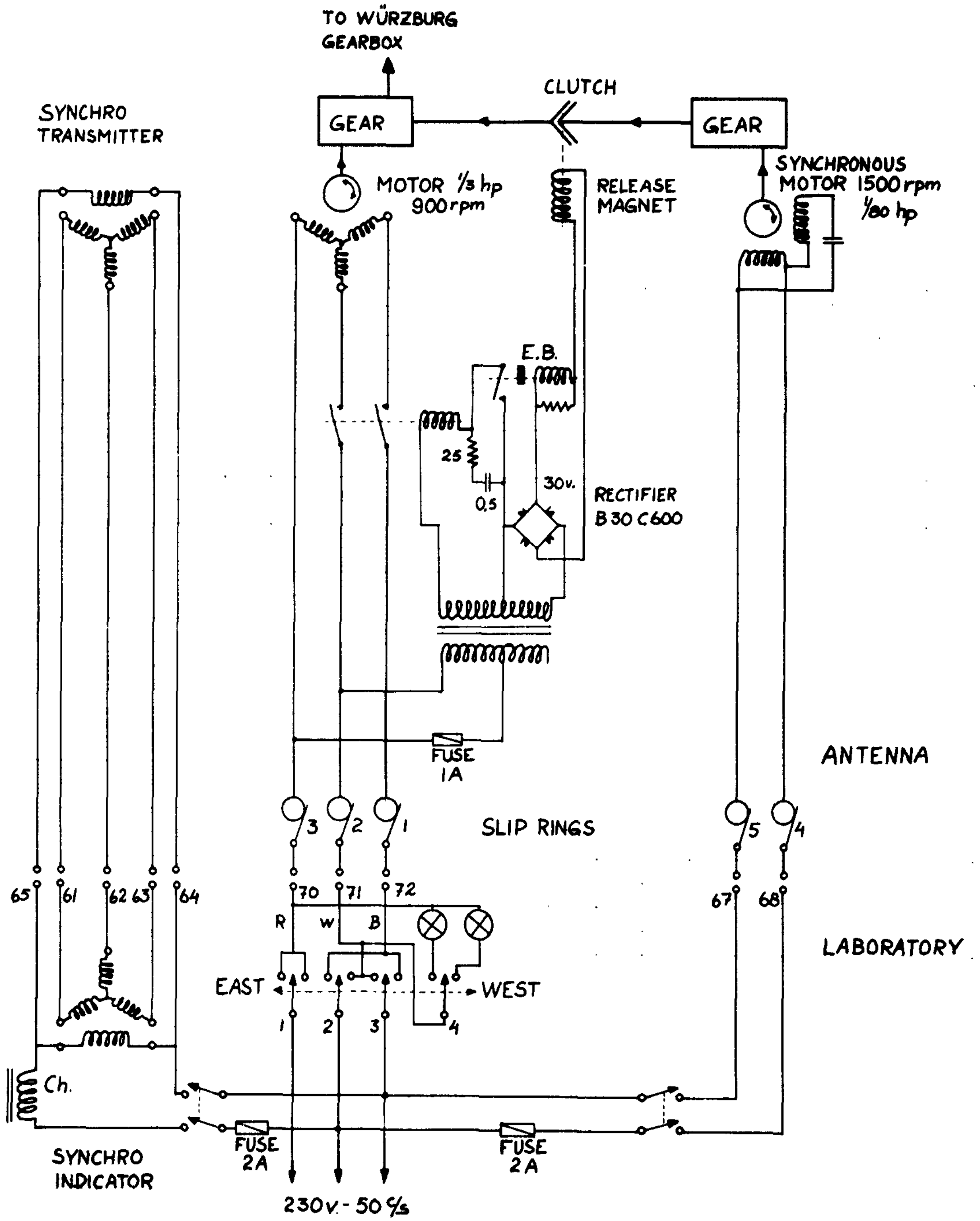


Fig. 3. Hour angle driving mechanism.

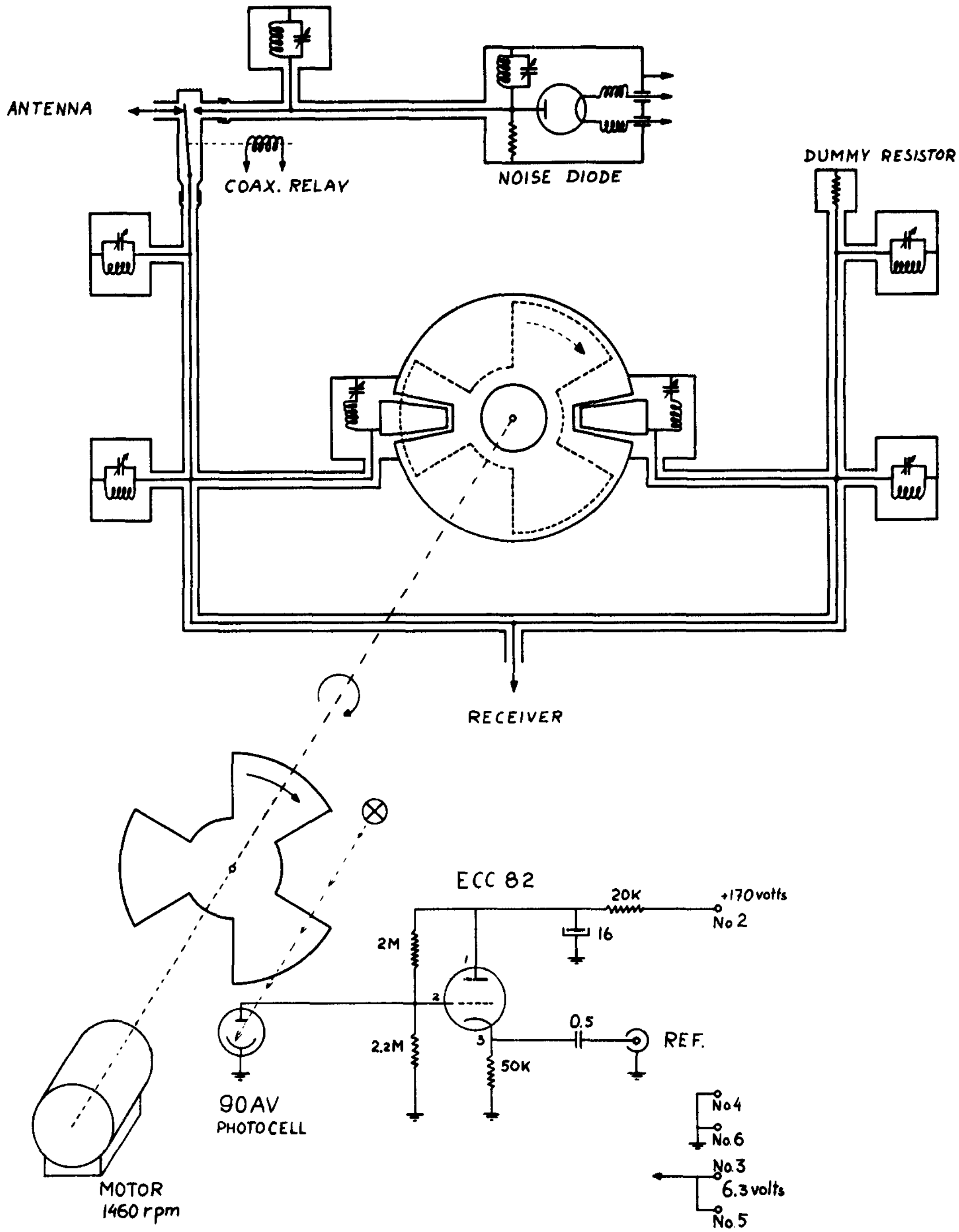


Fig. 4. Capacity switch.

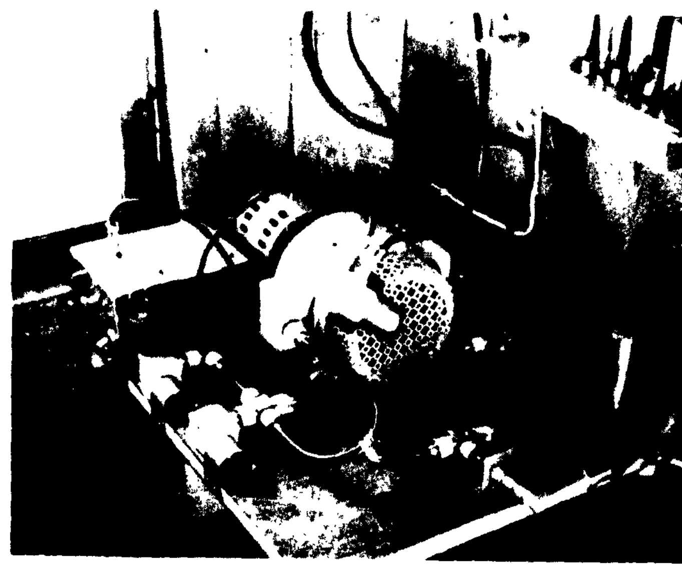


Fig. 5. View of capacity switch.

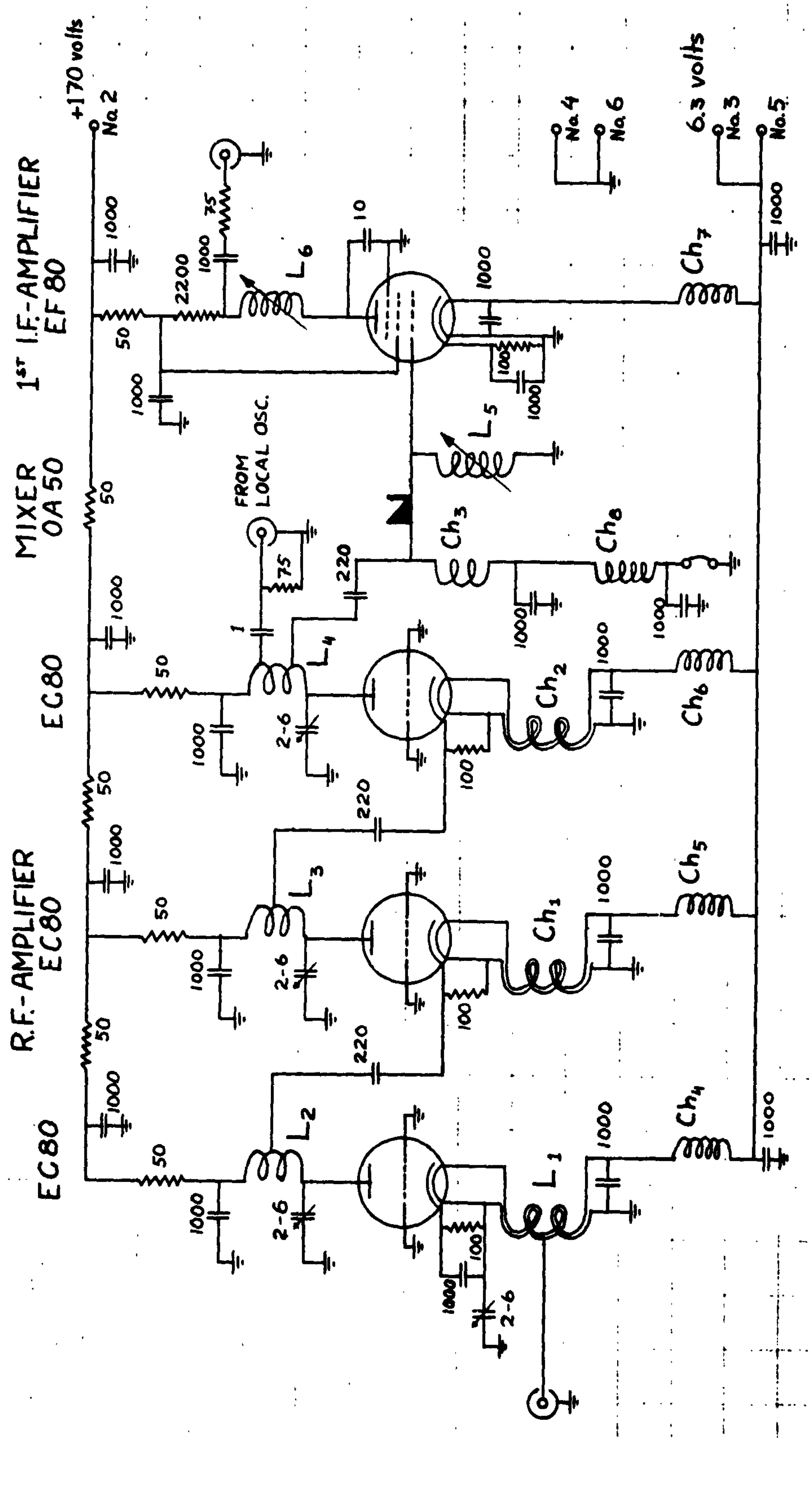


Fig. 6. Receiver r.f. section.

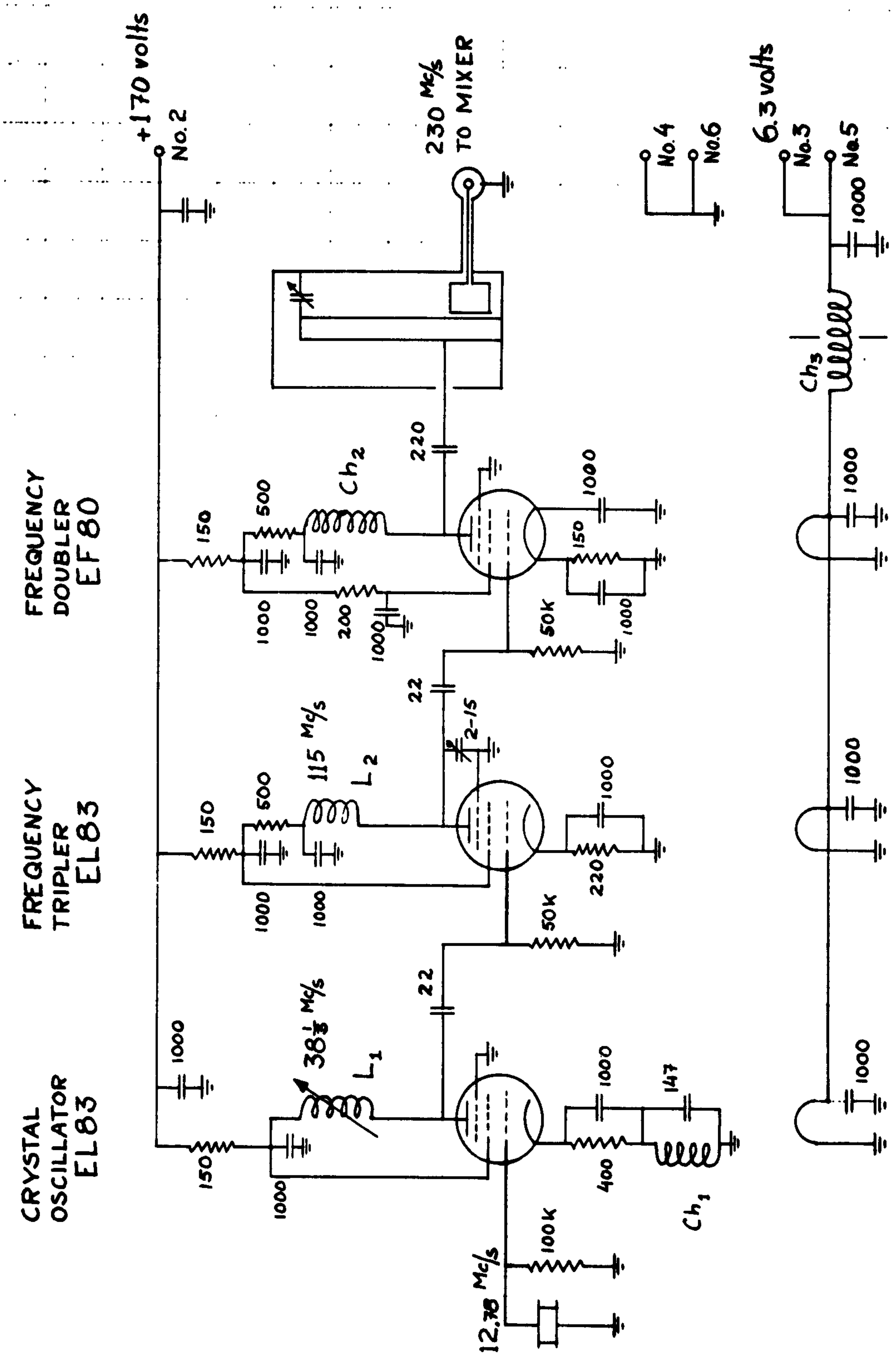


Fig. 7. Local oscillator.

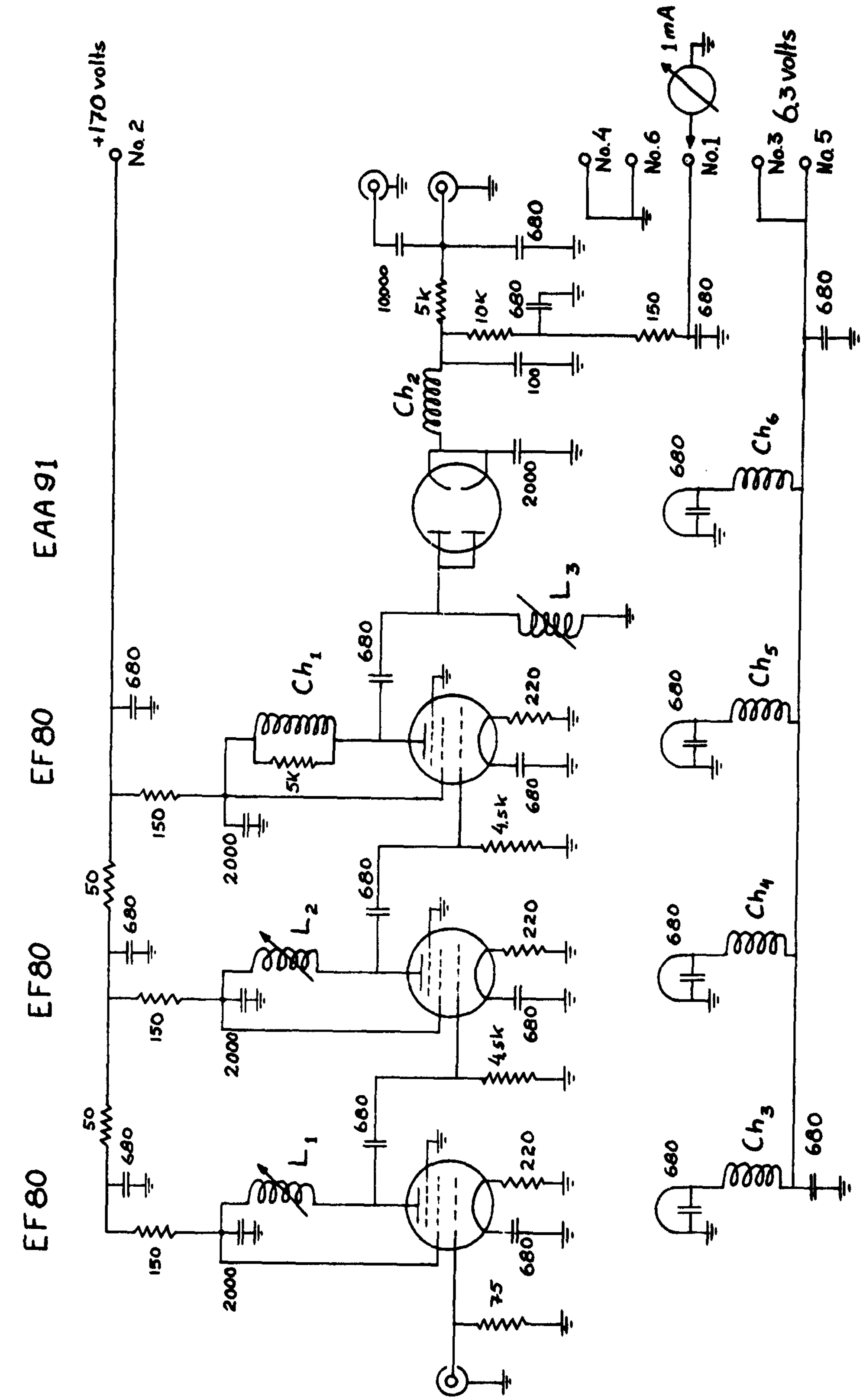


Fig. 8. Main i.f. amplifier 30 Mc/s.

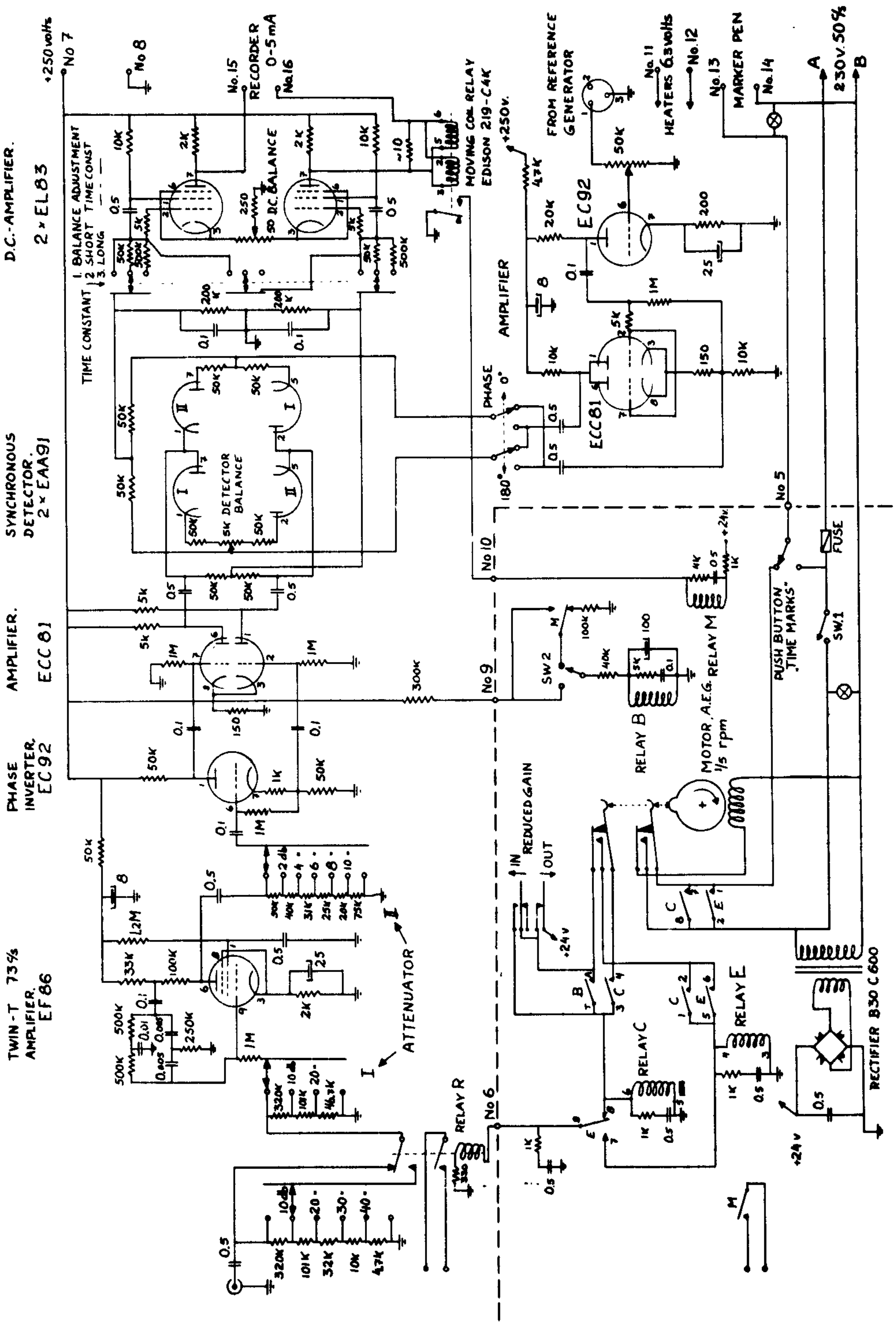


Fig. 9. The 73 c/s switch frequency amplifier.

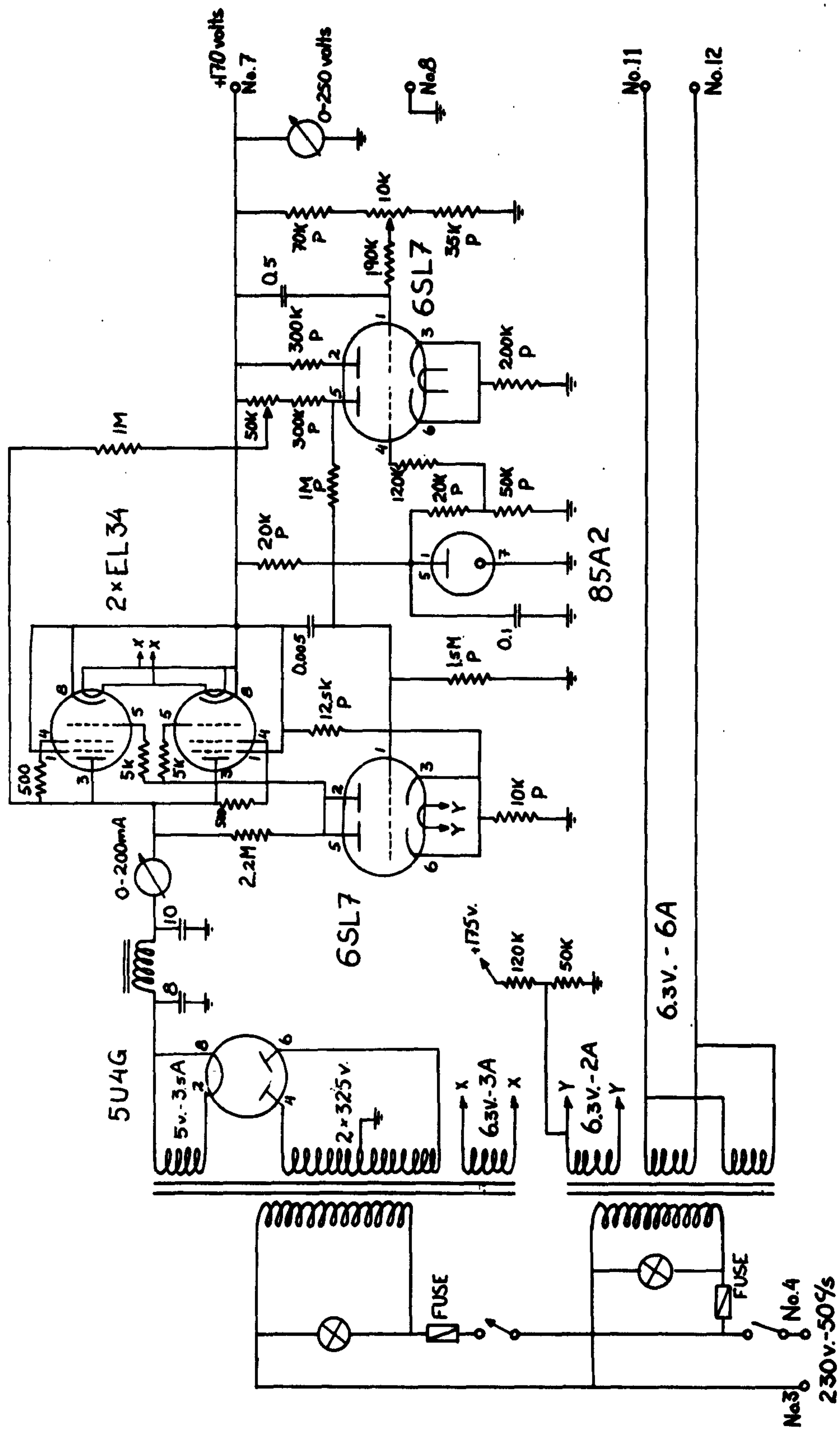


Fig. 10. Power supply for r.f. and i.f. sections.

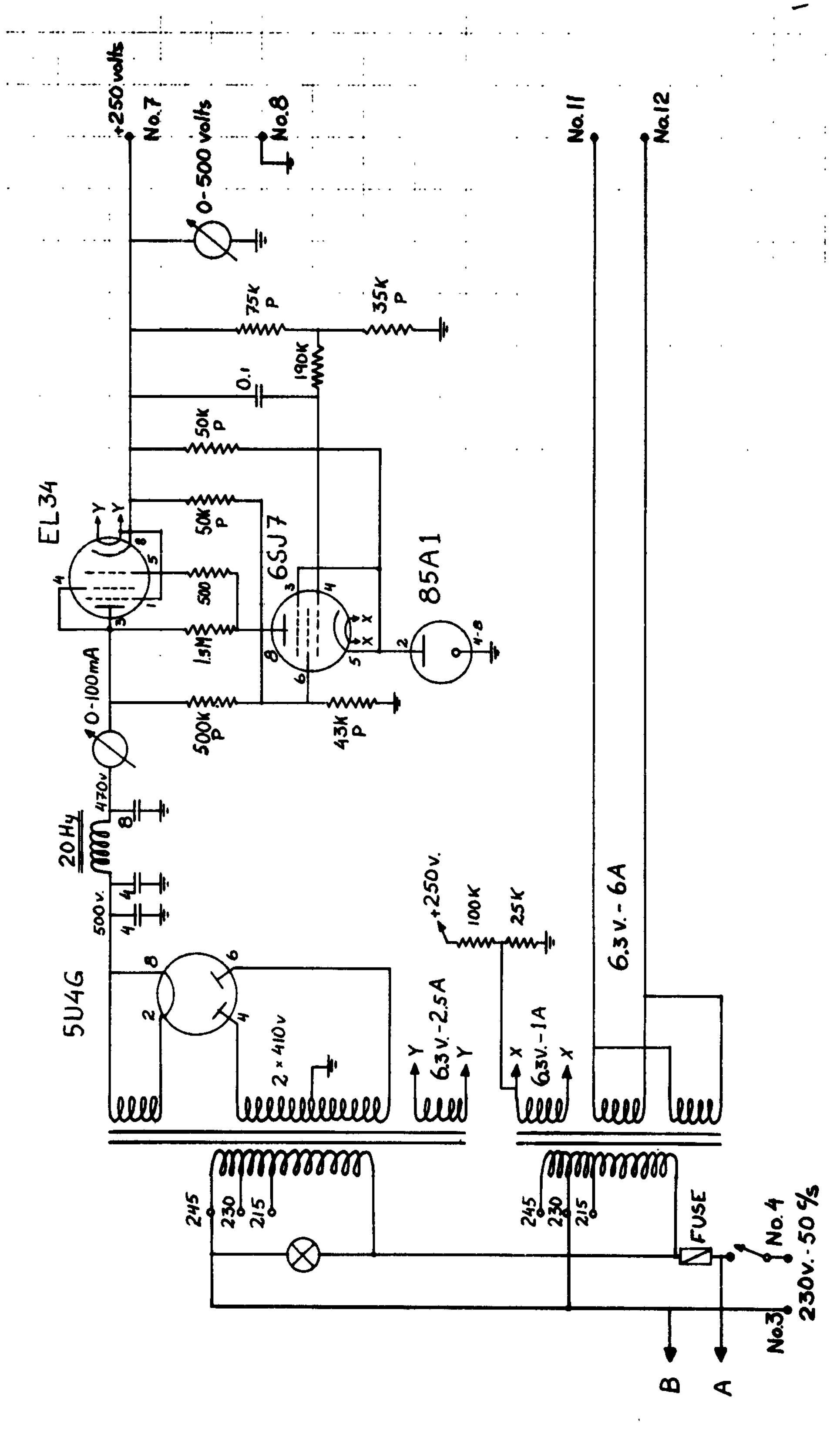


Fig. 11. Power supply for the 73 c/s amplifier.

FREQUENCY SPECTRA OF SOLAR NOISE STORM BURSTS IN THE 200 Mc/s RANGE

by

Øystein Elgarøy

FREQUENCY SPECTRA OF SOLAR NOISE STORM BURSTS IN THE 200 Mc/s RANGE

by

Öystein Elgaröy

ABSTRACT: A swept frequency receiver of high resolving power is described. Observations have been made with the instrument during solar noise storm periods. The records show that the center frequency of noise storm bursts frequently drifts towards lower or higher frequencies. In some cases more complicated drift patterns are found.

1. INTRODUCTION

During most solar noise storms, bursts of spectral type I (noise storm bursts) are emitted in the meter-wave region. These bursts have the same state of polarization as the background continuum, and are recognized by their short duration and small bandwidth. Because of the transient nature of the bursts, another observational technique must be applied than is normally used in investigations of more persistent phenomena. Two lines of approach have so far given valuable results: Firstly, observations on single or multiple, closely spaced frequencies with high-speed recording equipment, and secondly, observations with swept-lobe interferometers.

In 1950 Wild introduced swept frequency receivers, or radio spectroscopes, into solar research. Observations with such instruments yielded a succession of important results. But up to now all these receivers have covered a rather extended frequency range, which is scanned at most two or three times per second because of technical difficulties. Thus the resolution in time and frequency is insufficient for a closer investigation of narrow-band phenomena of short duration. The author therefore has tried to construct a radio spectrograph, especially adapted to meet these requirements, for the recording of storm bursts. The following is a preliminary report on the results of this work.

2. RECEIVING EQUIPMENT

A block diagram of the spectrograph is given in Figure 1. The parabolic Würzburg antenna at Harestua is connected to a two-stage broad-band preamplifier. The frequency sweep is made by varying the local oscillator signal between 165 Mc/s and 175 Mc/s with a condenser having one plate on a solid mount, the other being connected to a moving coil in a magnetic field. The coil is connected to the A.C. mains line through a transformer. Following the crystal mixer is a narrow-band i.f. amplifier centered at 30 Mc/s and a diode detector. The detected signal is further amplified in a video amplifier and led to the display unit, where it intensity-modulates the beam of a cathode-ray tube. The beam moves horizontally over the screen at a rate of fifty sweeps per second, synchronously with the local oscillator sweep. The screen is recorded on a film running at a constant speed in the vertical direction. Provisions have also been made for ampli-

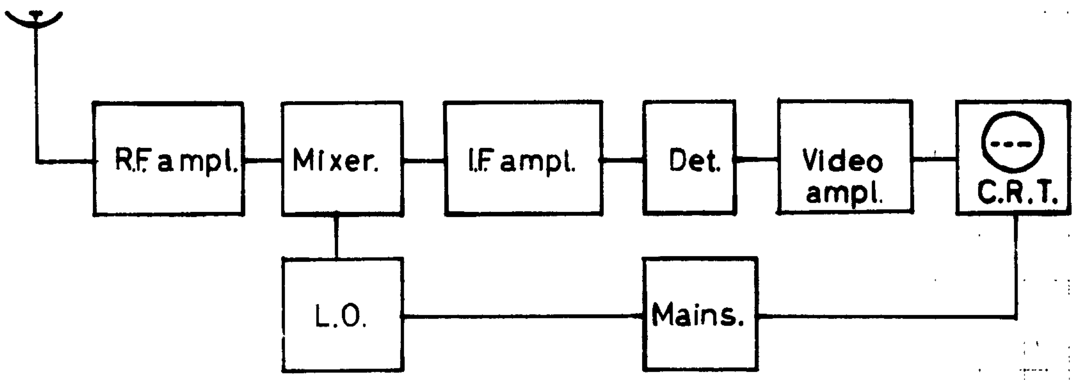


Fig. 1. Block diagram of the radio spectrograph.

tude display, but this has only been used occasionally. The time constant is below 0.1×10^{-3} s, and a film speed of 5.5 mm/s is found appropriate.

3. OBSERVATIONS

During 1957 high-speed records of storm bursts were taken simultaneously on neighboring frequencies of 199 Mc/s and 200.5 Mc/s at the Solar Observatory at Harestua. The analysis of the observations showed that the bursts frequently occurred at slightly different times in the two channels. This effect was interpreted as being due to a frequency drift of the transients. The spectrometer observations given here fully confirm this, and moreover give a more complete picture of the events than could be obtained by the previous technique.

When looking into the fine structure of the bursts, one is struck by the rich variation of the phenomena. After a preliminary survey, most bursts seem to fall into one of the following classes:

A. Stable bursts. No frequency drift. (Fig. 2 a, b)

B. Bursts with frequency drift from higher to lower frequencies. (Fig. 2 c, d)

C. Bursts with frequency drift from lower to higher frequencies. (Fig. 2 e, f)

D. Bursts having a more complicated frequency drift. (Fig. 2 g-l)

As will be seen from the examples, the spectrometer observations confirm that storm bursts are strongly monochromatic and of short duration, and further clearly reveal new features regarding their frequency characteristics. The center frequency is often unstable and wanders in the direction of the higher or lower end of the spectrum. It is noteworthy that drifts in either direction are about equally likely, as distinct from solar outbursts and isolated (fast-drift) burst. The drift rate seems to be of the order of some megacycles per second per second, but may sometimes reach higher values, and may even vary within the same burst.

The last examples in Figure 2 show an interesting reversal of the drift direction. In fact, the bursts appear much like miniature U-bursts. In some cases faint evidence has been found that even bursts with an oscillating center frequency may occur.

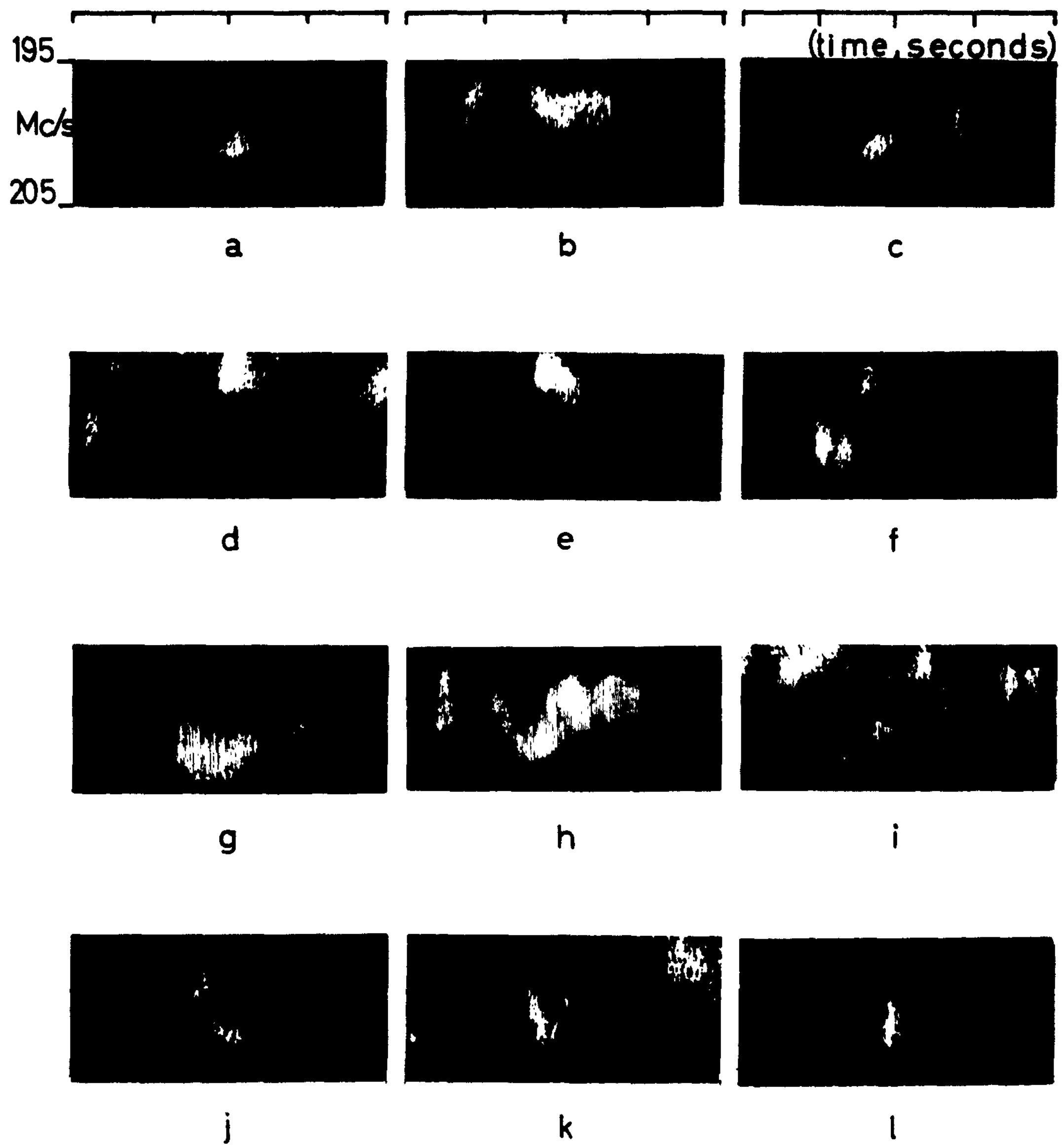


Fig. 2. Different types of noise storm bursts.

4. CONCLUDING REMARKS

The observations described in this note show that the frequency characteristics of different noise storm bursts may differ widely. This, of course, is of importance for theoretical considerations of burst-generating mechanisms. In the present paper only qualitative information is given, and further observations are necessary. An extended program, in which a better version of the sweep receiver is used, has now been going on for some time at the Solar Observatory at Harestua.

INTERFEROMETER OBSERVATIONS ON 200 Mc/s

by

Per Maltby

INTERFEROMETER OBSERVATIONS AT 200 Mc/s

by

Per Maltby

ABSTRACT: Positional determinations of solar radio sources made during the past two years with the 200 Mc/s interferometer at the Solar Observatory, Harestua are discussed. Observations of the degree of polarization are also treated.

It is found that noise-active sunspots may be associated with more than one noise storm during its passage across the solar disk.

1. INTRODUCTION

The 200 Mc/s interferometer at the Solar Observatory, Harestua has been in nearly continuous operation since February 1958. The interferometer consists of two identical mattress antennas, spaced 136.73 wavelengths apart on an east-west baseline. The position of a source in the solar atmosphere may be determined from the interferometer record with an uncertainty not exceeding 0.75 minutes of arc.

Since June 1958 information about the state of polarization has also been obtained by using an orthogonally polarized antenna in addition to the interferometer antennas.

A detailed description has been given elsewhere [1].

2. POSITIONAL DETERMINATIONS

In Figures 5 through 12 are reproduced some sketches of sunspot and plage configurations from the Daily Maps of the Sun published by the Fraunhofer Institut, as well as the 200 Mc/s position lines. The observations were made from February 1958 to November 1959. The positional lines show the position of the radio source at the moment when the sun crosses the meridian (about 1115 U.T.).

A comparison between the positional determinations made at the Nera station of the Netherlands PTT (255 Mc/s) and the Solar Observatory, Harestua, respectively, showed that the observations were in close agreement, when taking into account the difference in frequency.

On several occasions two or more sources are simultaneously present in the solar atmosphere. The observed position will be the "weighted" mean of the positions of the sources. A vanishing amplitude of the interferometer record may be obtained if there are two sources of constant equal power with an angular separation equal to an odd number of half-lobe spacings. This case was probably observed on April 3, 1958. A portion of the interferometer record is shown in Figure 1, together with the expected amplitude and period if one source were responsible for the
20 enhanced radiation.

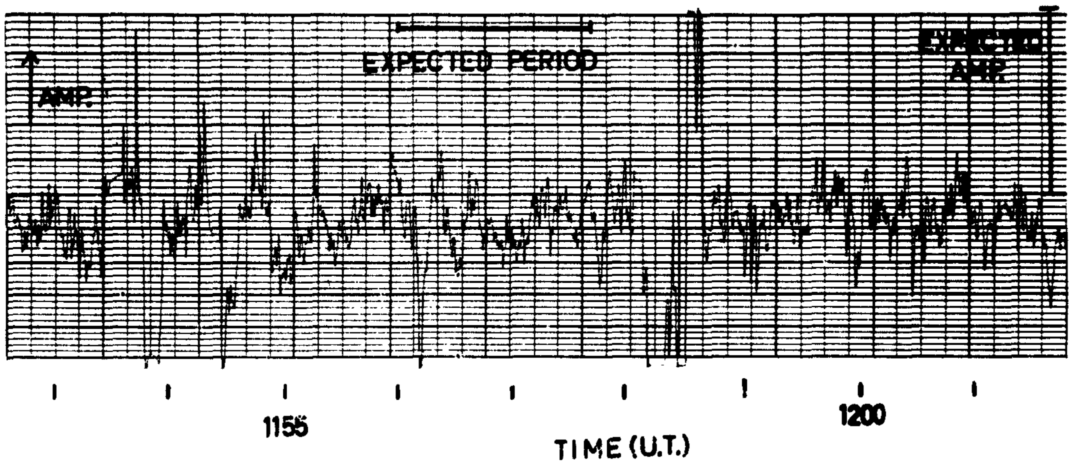


Fig. 1. Part of the interferometer record of April 3, 1958, with indication of the expected amplitude and period if one source were responsible for the enhanced radiation.

3. OBSERVATIONS OF POLARIZATION

The determinations of the state of polarization of radio sources are made from observations with three antennas, one of which is orthogonally polarized.

As pointed out by several authors the degree of polarization is usually close to unity when enhanced radiation is present. In Figure 2 the hourly mean degree of polarization P is plotted against the mean flux density F on 200 Mc/s for the same hour. It will be seen from Figure 2 that the

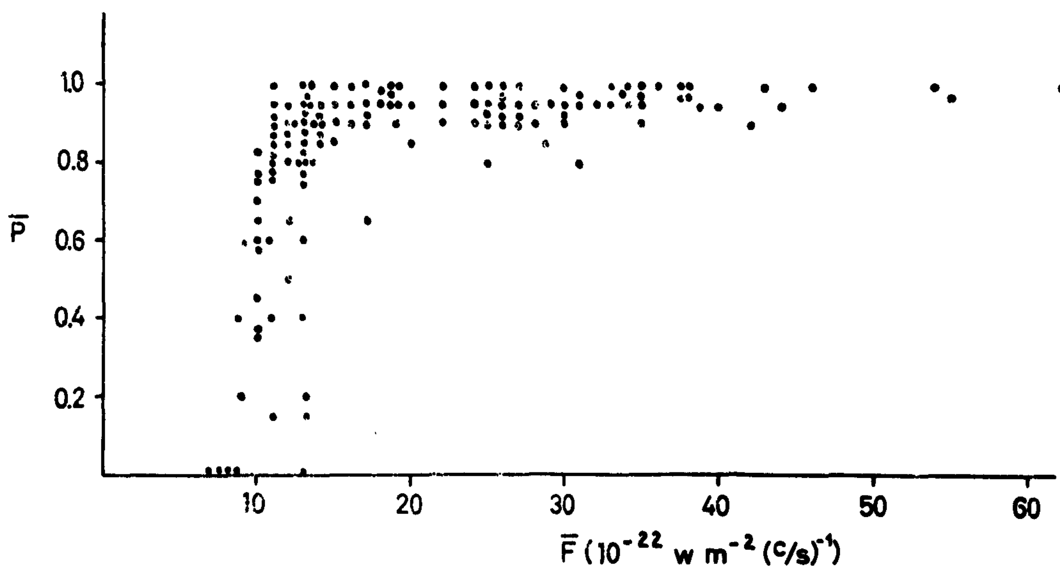


Fig. 2. The hourly mean degree of polarization P plotted against the hourly mean flux density F.

degree of polarization is usually close to unity; there are, however, a few instances where a small degree of polarization is observed.

Changes in the degree of polarization are usually associated with bursts or outbursts. It may be pointed out, however, that changes in the degree of polarization have been found in a few cases, although no features were present on the radiometer record. Neither was any change found in the position, associated with the change of polarization.

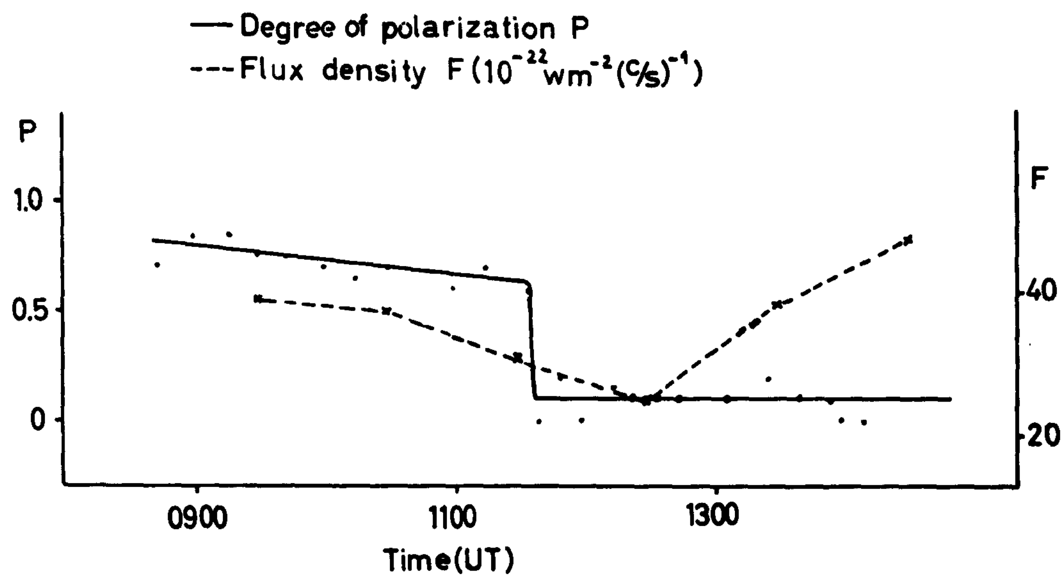


Fig. 3. The degree of polarization P and the flux density F plotted against time on September 1, 1959.

4. LIFETIME OF NOISE STORMS

Using an autocorrelation method, Machin and O'Brien [2] found that the lifetime of a noise storm at 175 Mc/s is comparable with the lifetime of the associated sunspot. Interferometer measurements made at the Nera station of the Netherlands PTT (255 Mc/s) and at Harestua (200 Mc/s) show that the sunspot may be associated with more than one noise storm during its passage across the solar disk. Such an effect will not be detected by a method of autocorrelation.

By giving the uncertain cases half weight it was found that 30 per cent of the noise active sunspots (62 in all) were associated with more than one noise storm. In Figure 4 the total number of days of noise activity of the spot during its passage over the solar disk is shown. The curve evidently differs from the duration of the noise storms.

Although these results are obtained at single frequencies, it is reasonable to presume that a sunspot may show noise activity more than once as it passes over the disk of the sun.

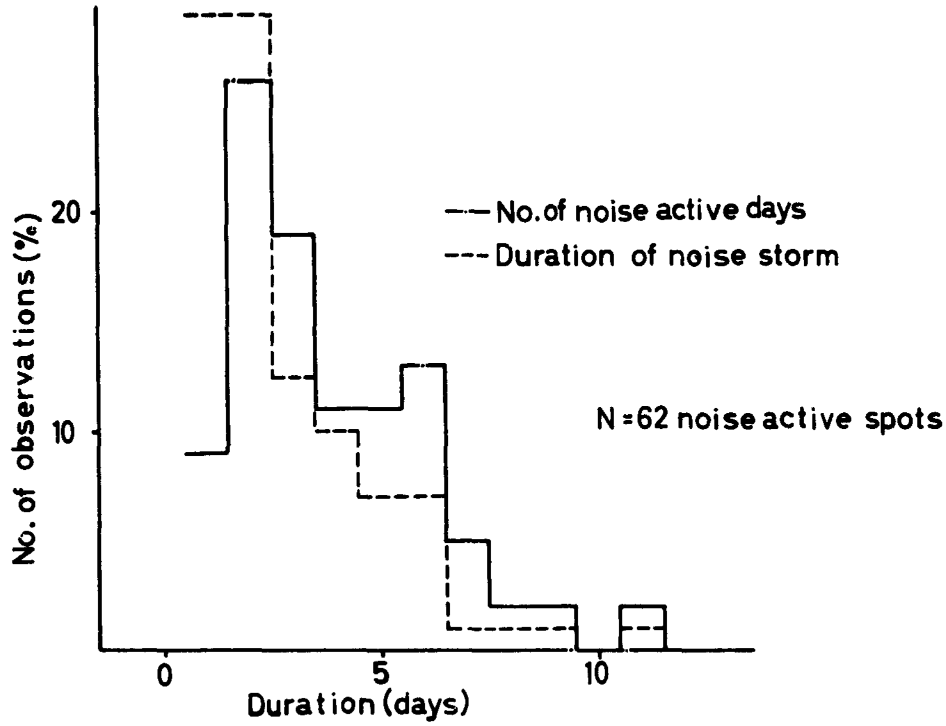


Fig. 4. Frequency distribution of number of days of noise activity of sunspot during its passage across sun's visible hemisphere, as well as the frequency distribution of the observed duration of noise storms.

REFERENCES

[1] Maltby, P. (1958) - The determination of position and polarization of sources of enhanced solar radiation on 200 Mc/s. Report No. 4, The Institute of Theoretical Astrophysics, Oslo.

[2] Machin, K. E. and P. A. O'Brien (1954) - The emission polar diagram of the radio-frequency radiation from sunspots. Phil. Mag. 7, 45 , 953.

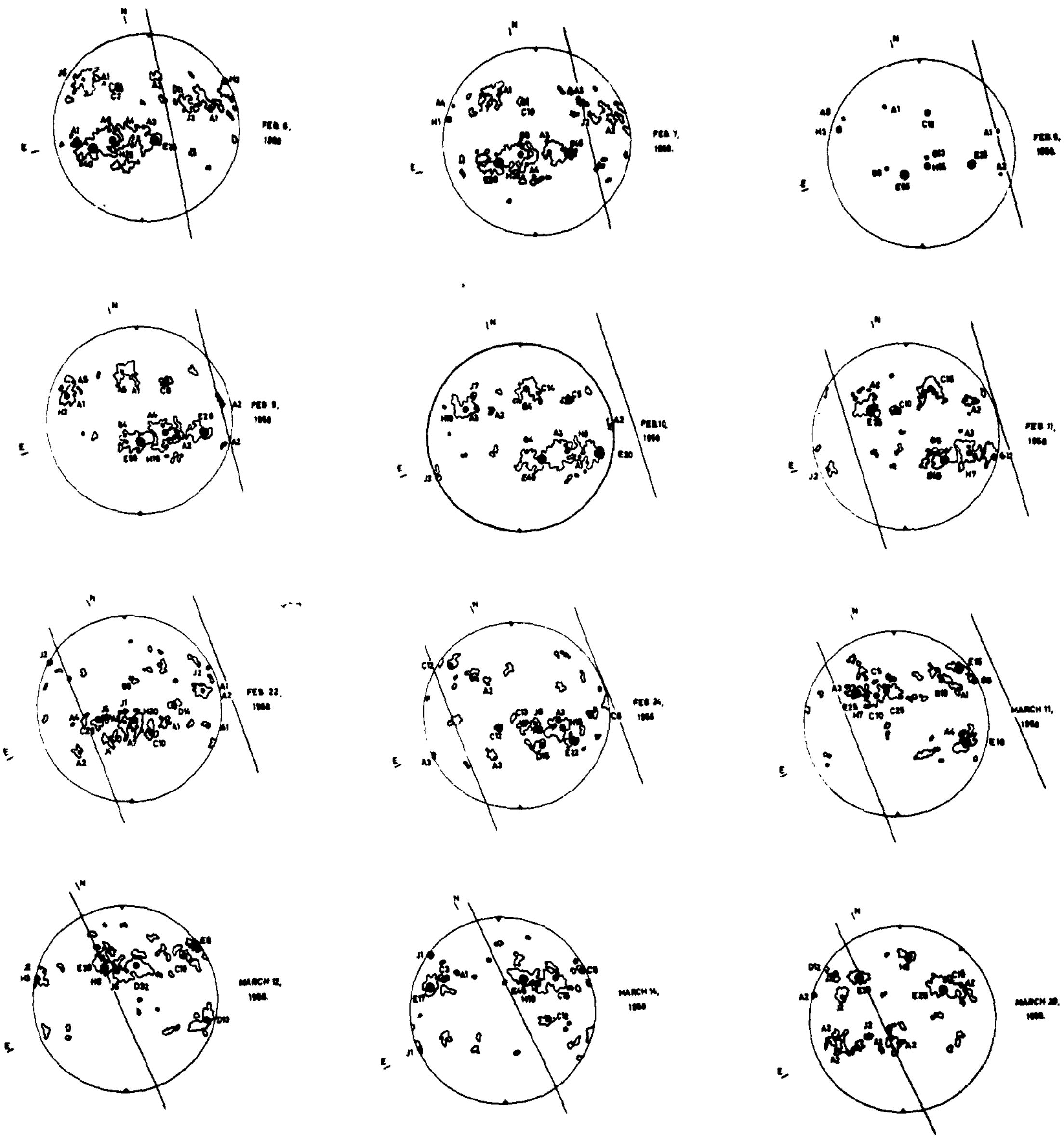


Fig. 5

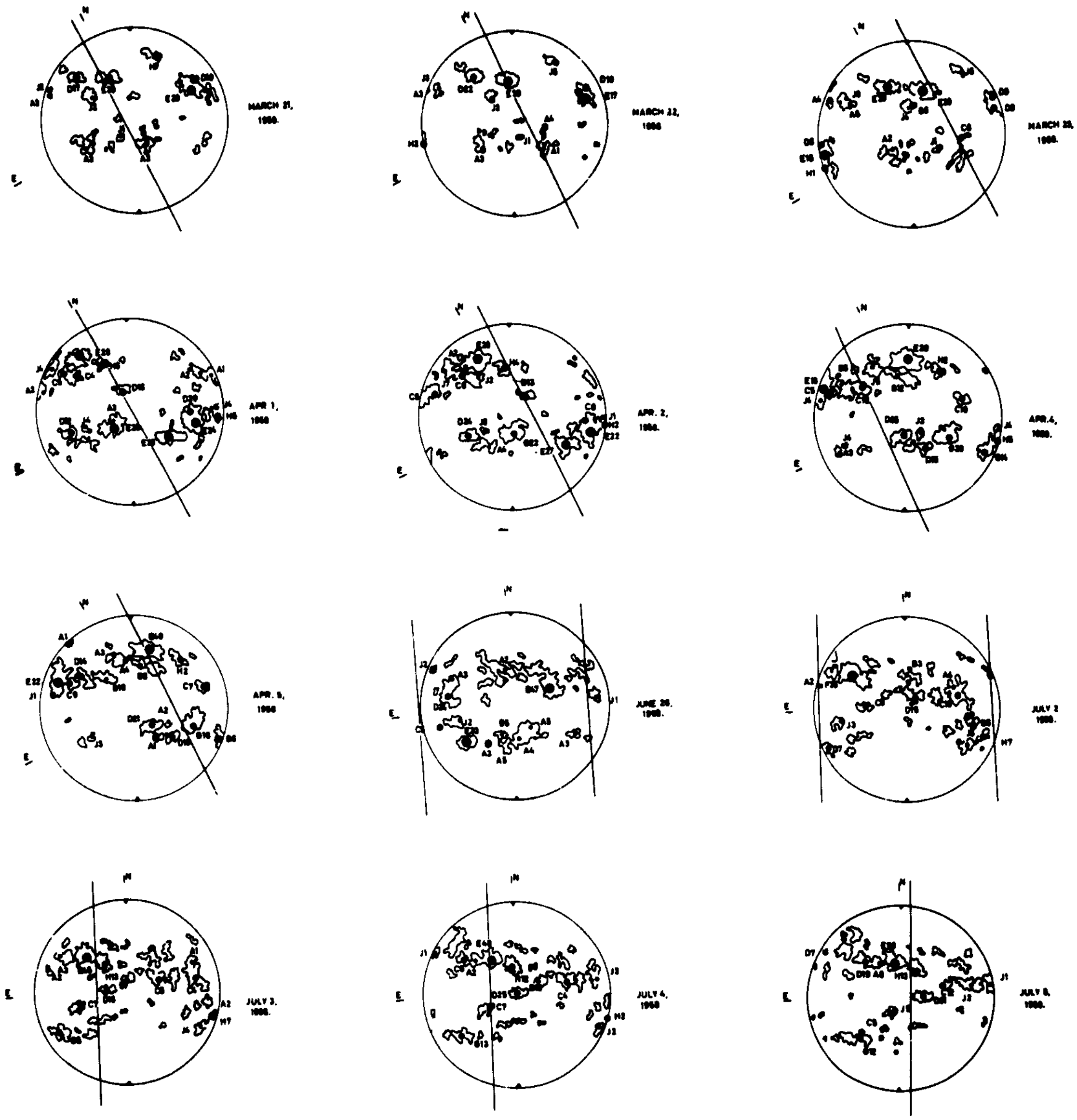


Fig. 6

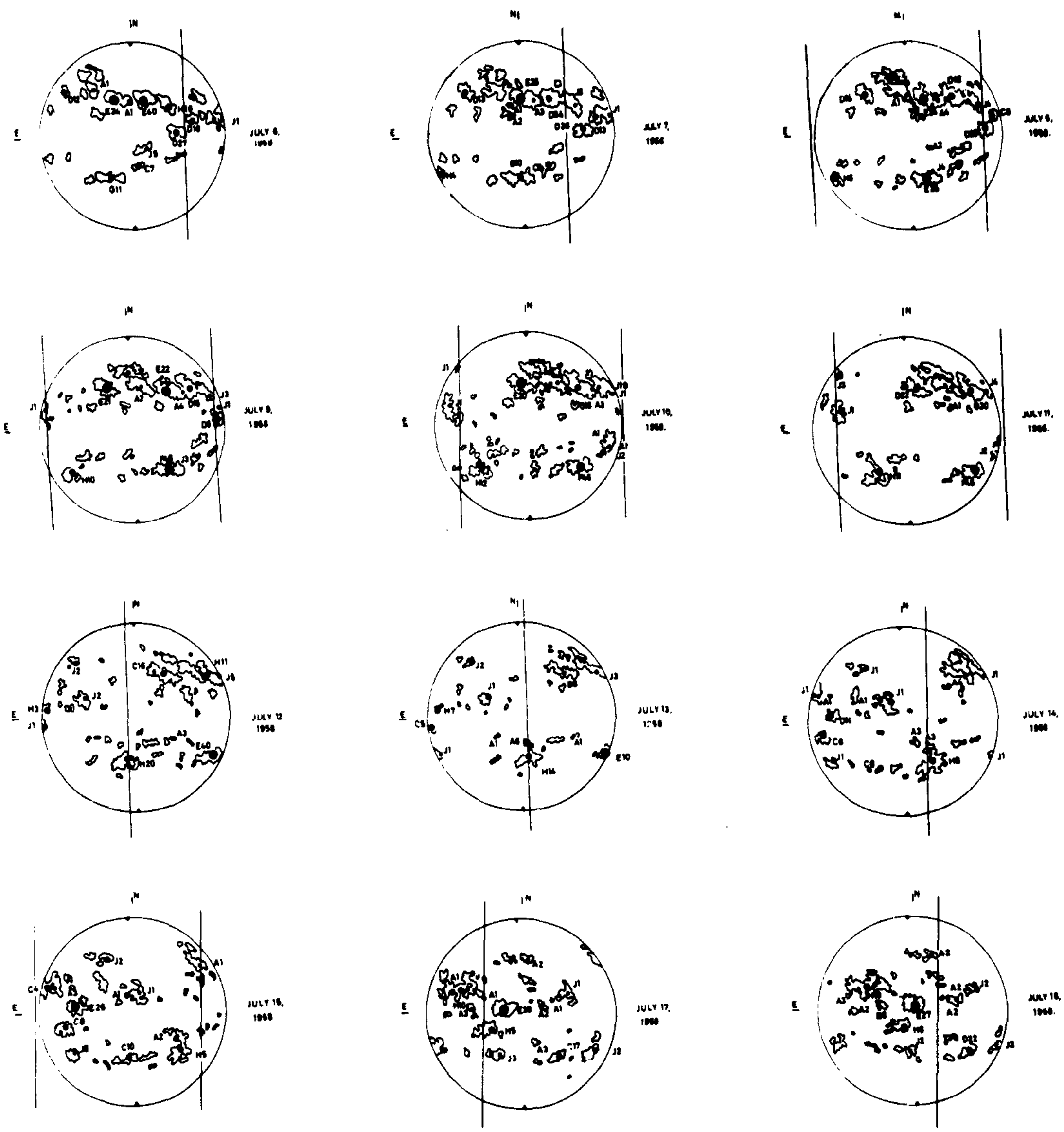


Fig. 7

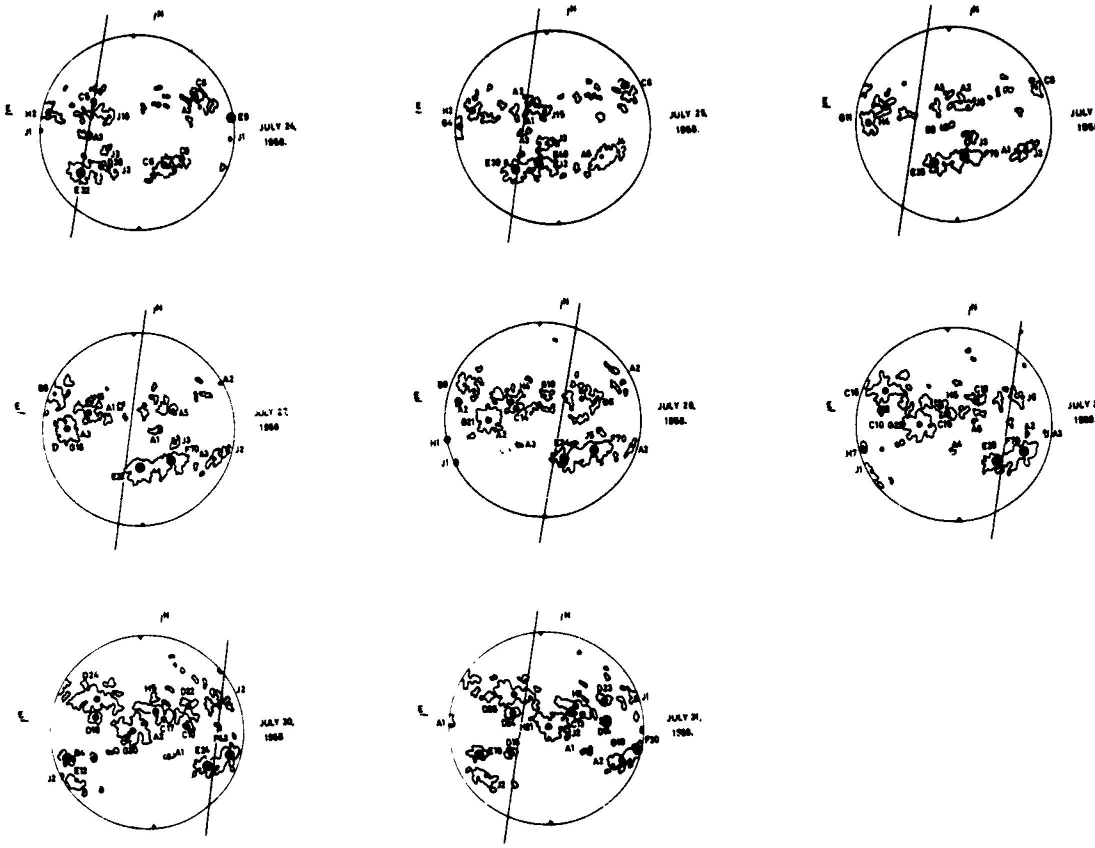
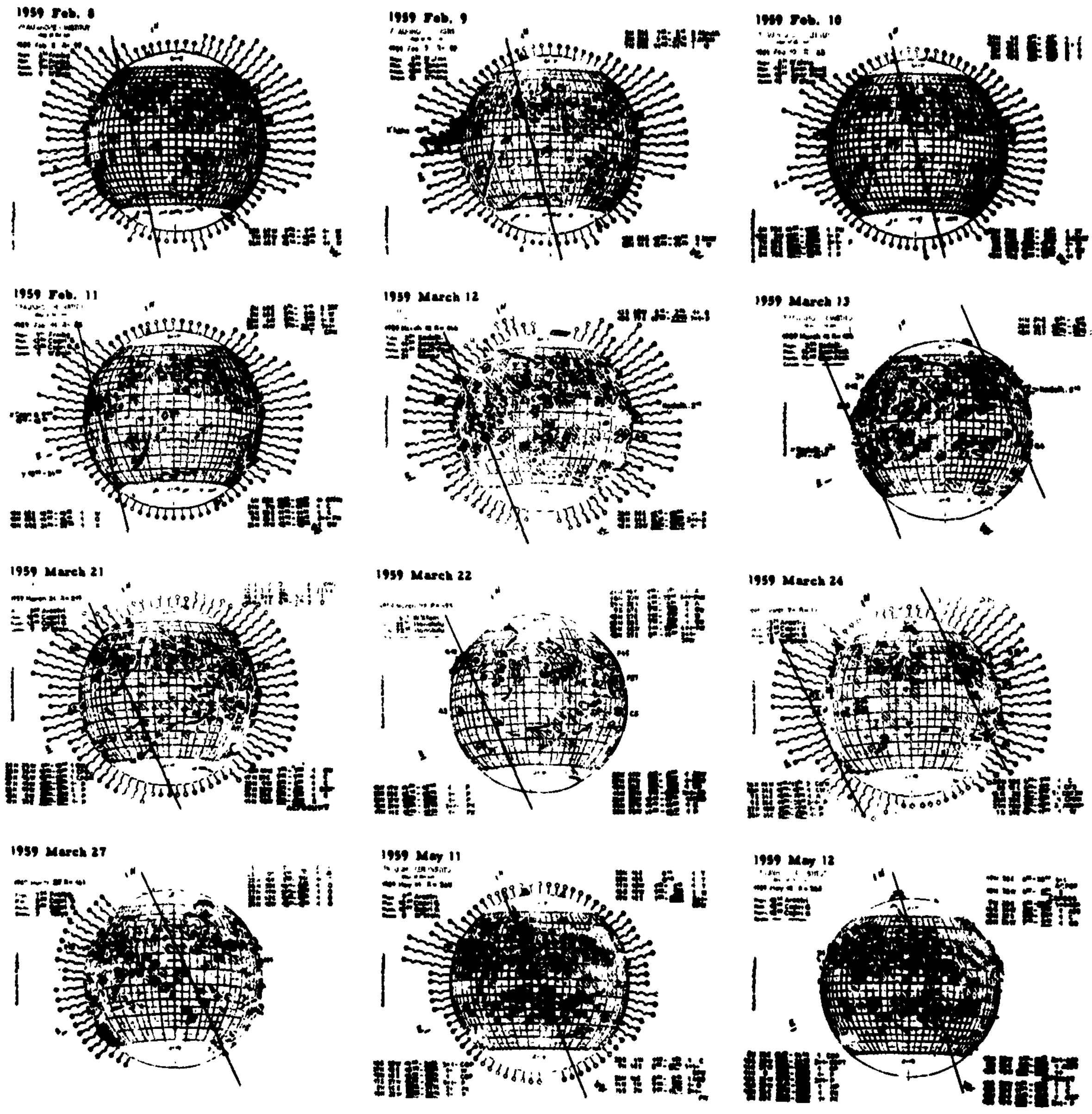


Fig. 8


1959 Feb. 8
1959 Feb. 9
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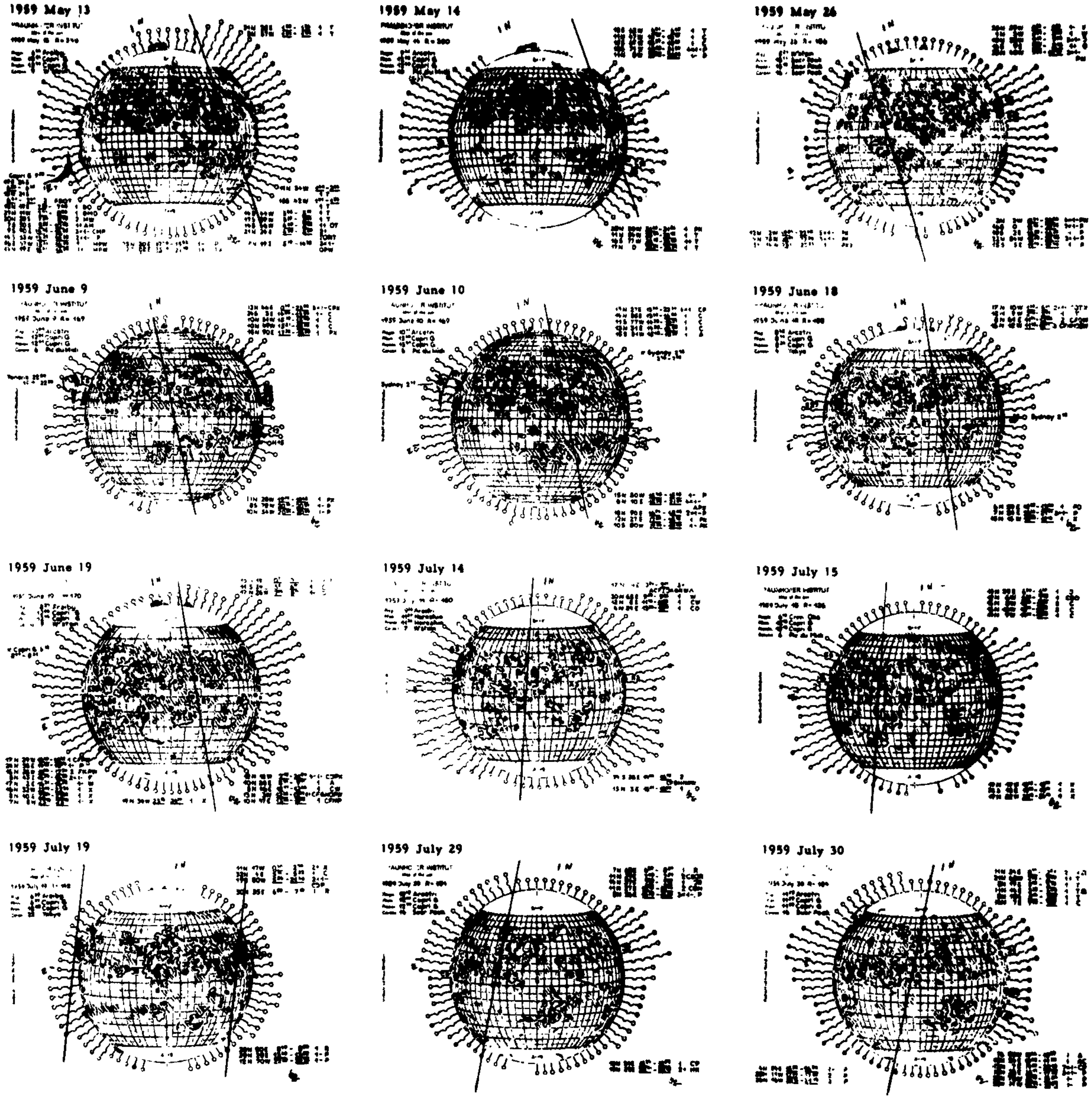
1959 May 11
1959 May 12

Fig. 9


1959 May 13
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1959 July 30

Fig. 10

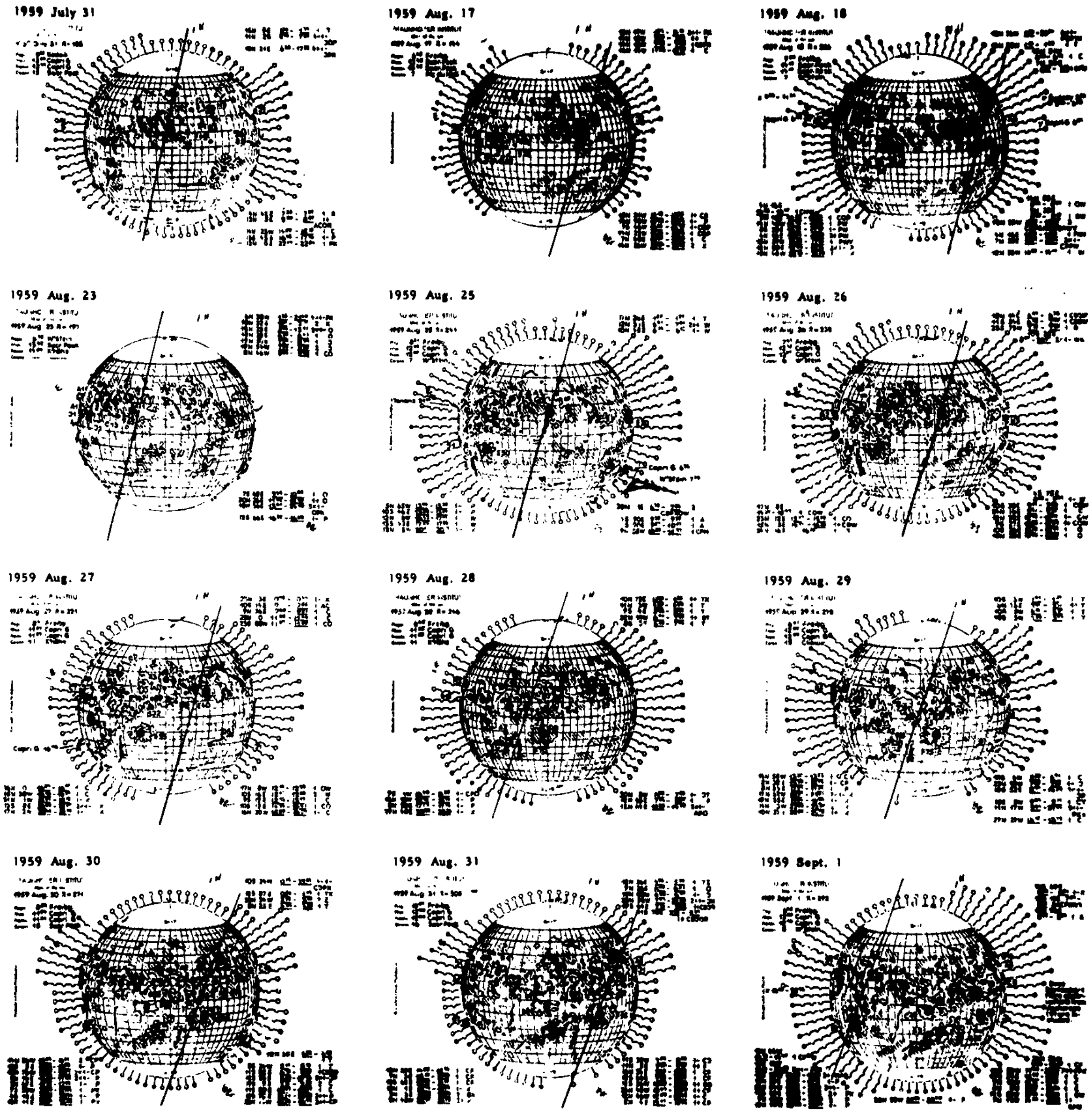
1959 July 31
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Fig. 11

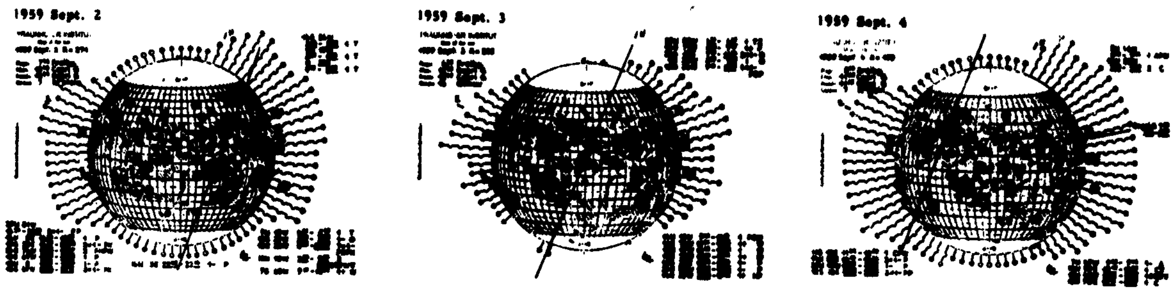


Fig. 12

A MODIFIED SCHEME OF TABULATION OF SOLAR RADIO NOISE DATA

by

Kjell Brekke

A MODIFIED SCHEME OF TABULATION OF SOLAR RADIO NOISE DATA

by

Kjell Brekke

ABSTRACT: A modified scheme is proposed for the tabulation of solar radio noise data. Characteristics included in the tabulation are the median intensity or flux density, the relative flux density variation, the variability or burst activity, and special occurrences. The scheme includes important information not contained in the present standard reports.

1. INTRODUCTION

Regular long-term observations of solar radio noise began in 1946, and from the beginning of 1947 some observations were included in the Quarterly Bulletin of Solar Activity. From the first quarter of 1949 arrangements were made for the solar radio noise data to be compiled and edited at the Commonwealth Observatory, Canberra, in collaboration with the Radiophysics Laboratory, Sidney.

The information provided by solar noise recordings is so varied that descriptive data must be carefully systematized if they are to be published in a compact and convenient form. A scheme of tabulation has been devised by the Assembly of Solar Radio Noise Data for the Quarterly Bulletin of Solar Activity (C. W. Allen). The actual form of the tabulations is strongly influenced by Dr. M. Waldmeier, who is in charge of the publication of the data at Zürich. The reason is that there is some advantage to giving the tabulations of solar noise data a form similar to the tabulation of sunspot, flocculi, flare, ionospheric and geomagnetic data.

For the time being the solar radio noise data are tabulated according to a scheme proposed by C. W. Allen. This standard tabulation does not, with respect to many applications, give a fully satisfactory description of the solar radio noise recorded.

The present paper proposes a modified scheme of tabulation, which observers and data users alike may find to be an improvement. The scheme is so constructed that an extract tabulated on the standard form may serve as a report to the Quarterly Bulletin of Solar Activity.

2. GENERAL CONSIDERATIONS

The necessity of a more adequate nomenclature becomes obvious on considering the four different records of solar radio noise at 200 Mc/s shown in Figure 1.

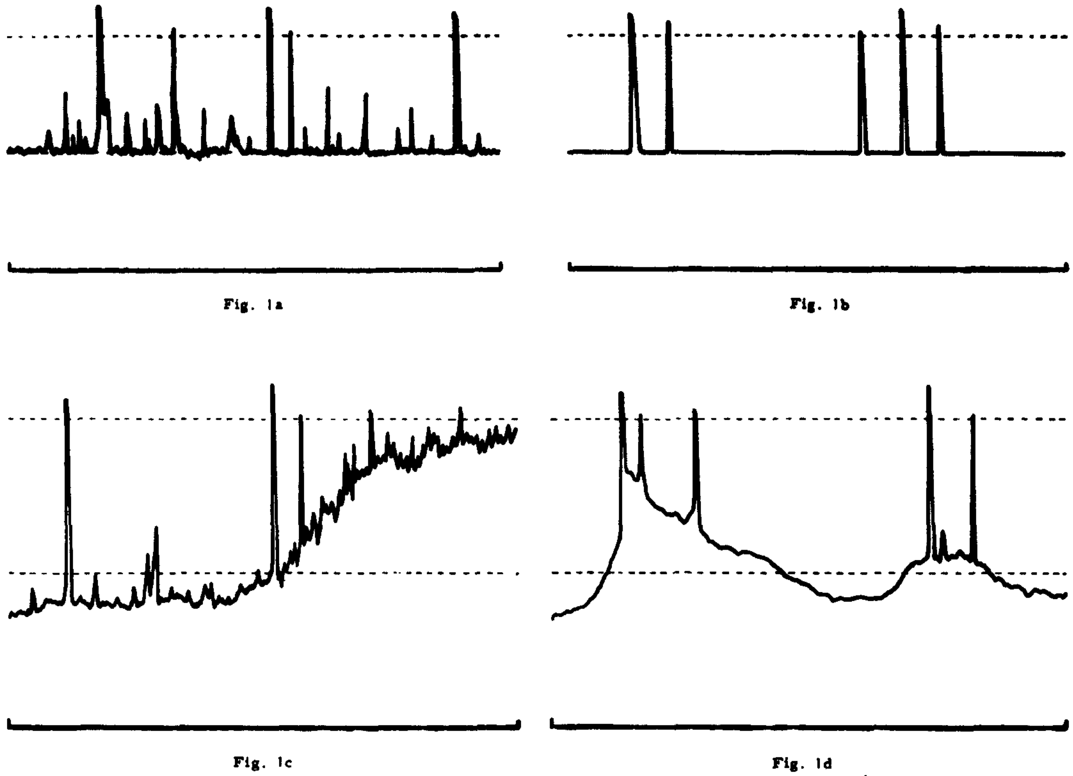


Fig. 1. Different solar radio noise features on 200 Mc/s.

Figures 1-a, b, c and d represent records with the same median flux density and the same variability factor. They are hence reported as identical radio noise features in the present standard tabulation.

As seen from the figure, information that may be of physical importance is excluded in the standard reports. This is especially conspicuous in cases c and d where the prominent base level variation is left unreported.

In working out the new scheme an effort has been made to enable the observer to extract and tabulate a maximum of information by simple inspection of the solar radio noise records. Although the tabulation becomes more comprehensive, it is necessary to confine the tabulated data to the ones that seem to be of special physical interest.

3. THE TABULATION

The characteristics to be tabulated are:

I. Median intensity or flux density.

II. Relative flux density variation.

III. Variability (burst activity).

IV. Special occurrences, not adequately described by the preceding characteristics.

3.I. FLUX

The flux densities tabulated are medians, i.e. the value that is exceeded for half the period under consideration (1 hour). The unit chosen is 10^{-22}w $m^{-2}(c/s)^{-1}$. This suffices to express nearly all observations with appropriate accuracy without the use of decimals.

In the reports to the Quarterly Bulletin of Solar Activity one would use 3-hour medians and weighted daily means of these.

3.II. FLUX DENSITY VARIATION

(Variation of Base Level)

This characteristic is the relative variation in flux density in the course of one hour. To tabulate the type and amount of variation the following scale is suggested:

0 - No observable variation in flux density
1 - Slight — " —
2 - Moderate — " —
3 - Strong — " —

The following terminology is used to describe the mode of variation:

i - Simple increase in flux density
d - Simple decrease — " —
c - Complex variation — " —

The index c is used only when the record shows a rather jagged pattern.

Sample descriptions are shown in Figure 2.

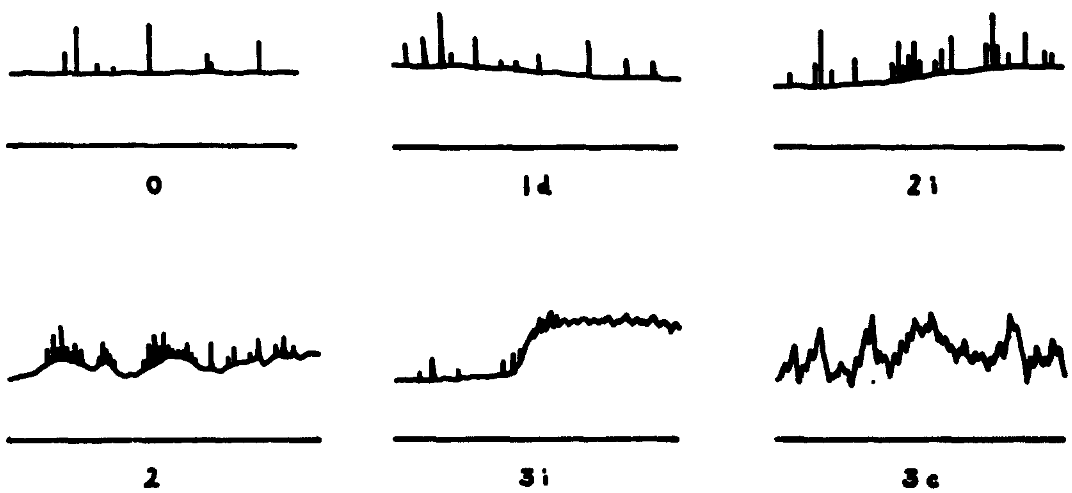


Fig. 2. Examples of description of relative variation in flux density, using proposed scheme.

3.III. VARIABILITY

(Burst Activity)

The burst activity is measured by the variability index (values 0, 1, 2 and 3). The only bursts affecting the variability index are those with intensities greater than the median intensity, measured from the median intensity level. A burst n times as great counts as n bursts.

The scale used at present at the Solar Observatory at Harestua is:

0	0 - 3 bursts per hour
1	4 -14 — " —
2	15 -50 — " —
3	Above 50 — " —

This scale obviously neglects all bursts not reaching the double median flux level, although the small bursts often represent a dominant feature in the time interval considered.

To meet this objection, an asterisk is added to the variability index if the record shows a predominant small-burst pattern. If, on the other hand, all or the main part of the bursts observed affect the variability index, the index is underlined (pure index).

A tendency of grouping is reported by means of a G added to the variability index. To distinguish between strong and moderate grouping tendencies a G or a *g* may be used.

3.IV. SPECIAL OCCURRENCES

Transient increases in intensity, not adequately described by the preceding indices, are listed separately. This list should include not only the most striking radio events. Less pronounced features may also be of physical importance.

Events to be tabulated are:

a) Noise storms and base level rises.

b) Outbursts.

c) Strong bursts and burst groups.

d) Peculiar intensity variations.

a. Noise Storms

Data to be tabulated are:

Time when noise storm was first observed.

Time when noise storm was last observed.

Type of noise storm.

A single station will usually be unable to observe a complete noise storm from beginning to end. The times tabulated thus merely mark the beginning and the end of the period of observation. If the time tabulated refers to a *real* start or end of a noise storm, the time given is underlined.

The symbols used to describe the type of noise storm are (Fig. 3):

N0 Noise storm consists of pure burst activity. No significant rise in base level.

N1 Noise storm consists of burst activity with significant rise in base level.

N2 Noise storm consists of burst activity with appreciable rise in base level.

N3 Noise storm consists of appreciable rise in base level with no significant burst activity superimposed. (Ordinarily classified as a type 4 burst [1], but this requires simultaneous polarisation and interferometer measurements, and also that an associated flare is observed.)

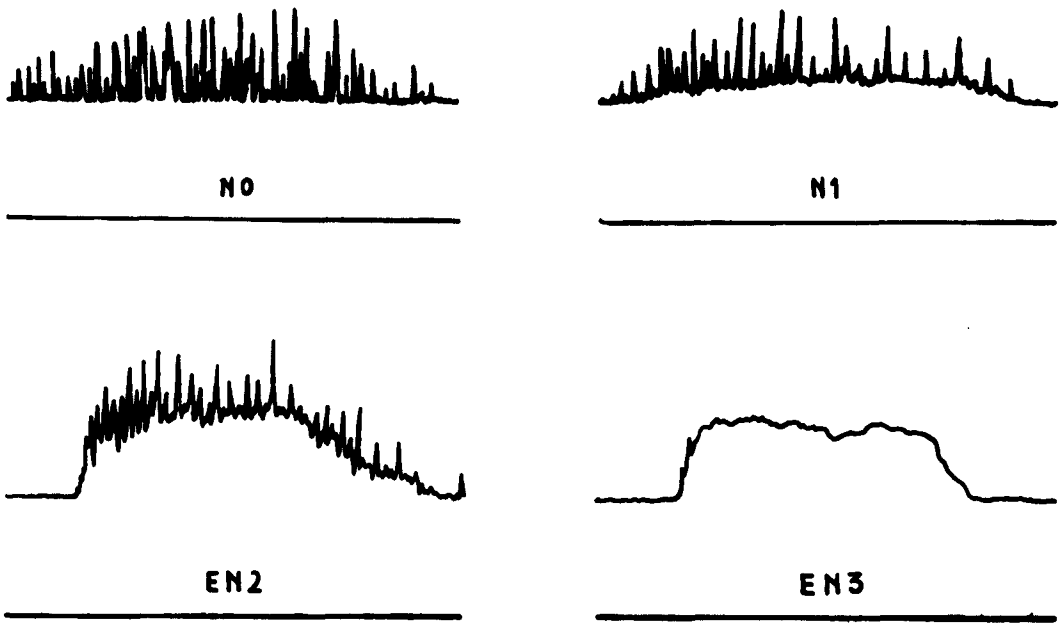


Fig. 3. Examples of type description of solar noise storms, using proposed scheme.

If the noise starts suddenly, another symbol, E, might be used before the type description, e.g. E N2 (Fig. 3).

b. Outbursts

Radío events tabulated as outbursts are mainly strong intensity increases of short duration.

Data to be tabulated are:

i. Time of start.

ii. Time of maximum intensity.

iii. Duration.

iv. Type.

v. Peak flux density.

vi. Equivalent flux density (smooth intensity).

i. Time of start

If the time of start is not clearly defined on the record, it is taken as the time when the occurrence first reaches 0.2 of its smoothed intensity.

ii. Time of maximum intensity

This is the time when the occurrence reaches its peak intensity. If the time of maximum has to be estimated, an x is added to the time given.

iii. Duration

The duration of an event is given in minutes, to an accuracy of 0.25 minute, counting from the start to the end of the outburst. If the time of end is not clearly defined it is taken as the time when the occurrence again reaches 0.2 of its smoothed intensity.

When the time of start (end) is estimated, an x is placed before (after) the duration time. If both time of start and time of end are estimated, an x is placed both before and after the duration time.

iv. Type

The following symbols are used (as before):

S - Simple rise and fall of intensity.

C - Complex rise and fall of intensity.

A - Appears to be part of general activity.

D - Distinct from (i.e. apparently superimposed upon) the general activity.

M - Consisting of several peaks separated by undisturbed intervals of relatively long duration.

F - Consisting of several peaks separated by short undisturbed intervals.

E - Sudden commencement.

v. Maximum intensity

By maximum intensity is meant the maximum flux density value of the outburst given in units of $10^{-22} w\ m^{-2}(c/s)^{-1}$. Peaks that are due to short duration bursts "superimposed" upon the occurrence are generally not considered as belonging to the outburst when the maximum flux density value is determined.

vi. Equivalent flux density (smoothed density)

The equivalent flux density is intended to give a measure of the excess energy emitted at the frequency considered during the occurrence. It is measured from the level that would have been observed in the absence of the outburst, and amounts to the intensity of a hypothetical outburst with constant intensity and the same duration as the real outburst, representing the same total energy. An example is shown in Figure 4.

If an outburst appears just before or during the early phase of a noise storm or base level rise a *plus* sign (+) is placed after the type code. A *minus* sign (-) is used when it appears during the late phase or just after a noise storm or a base level rise. Examples are shown in Figure 5.

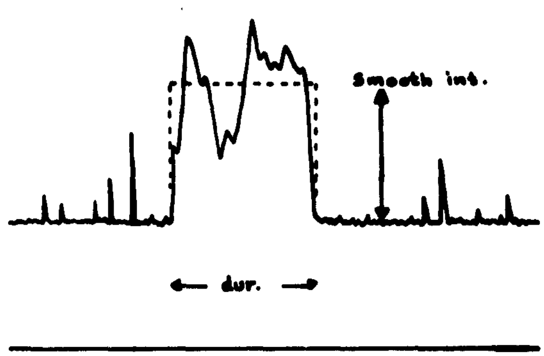


Fig. 4. Smoothed intensity shown as representing the intensity of a hypothetical outburst with constant intensity and the same duration and the real outburst, with the same total energy.

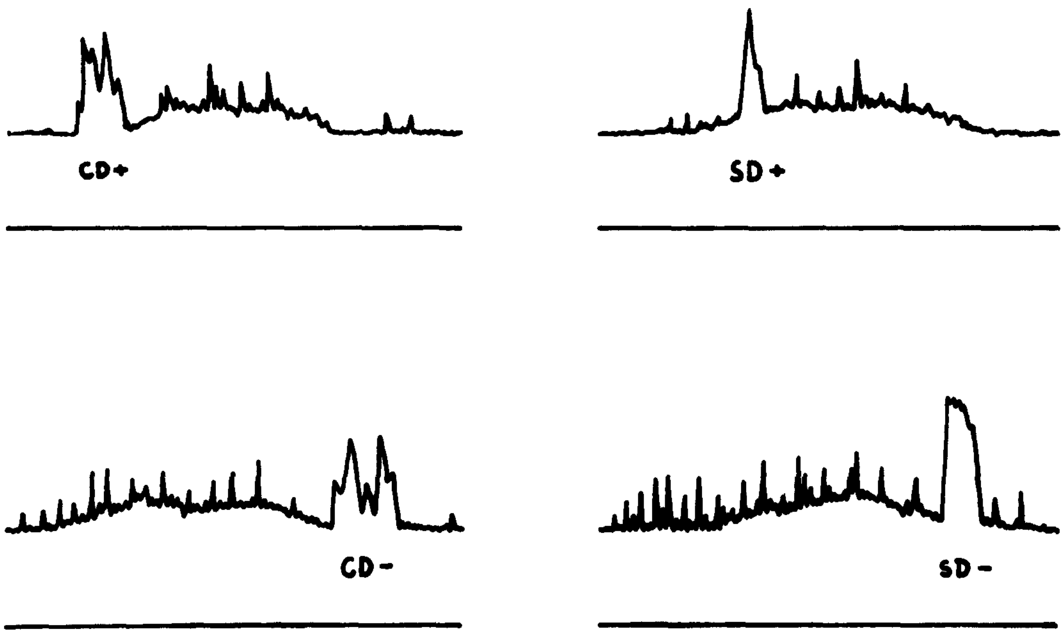


Fig. 5. Examples of coding early or late occurrence of outbursts during noise storm or base level rise.

In the case of strong bursts and isolated burst clusters that are not strong enough to be reported as outbursts, the following data are tabulated:

Starting time.

Duration time, when more than half a minute.

Type.

The symbols used for type description are:

B - Strong burst.

BC - Burst cluster (complex burst).

Examples are shown in Figure 6.

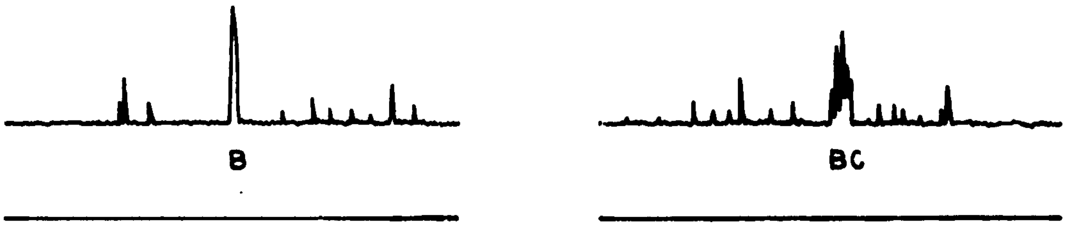


Fig. 6. Coding of strong bursts and burst groups.

Plus and minus signs may be used in connection with the type code in the same way as in the case of outbursts appearing together with a noise storm or a base level rise.

d. Peculiar Intensity Variations

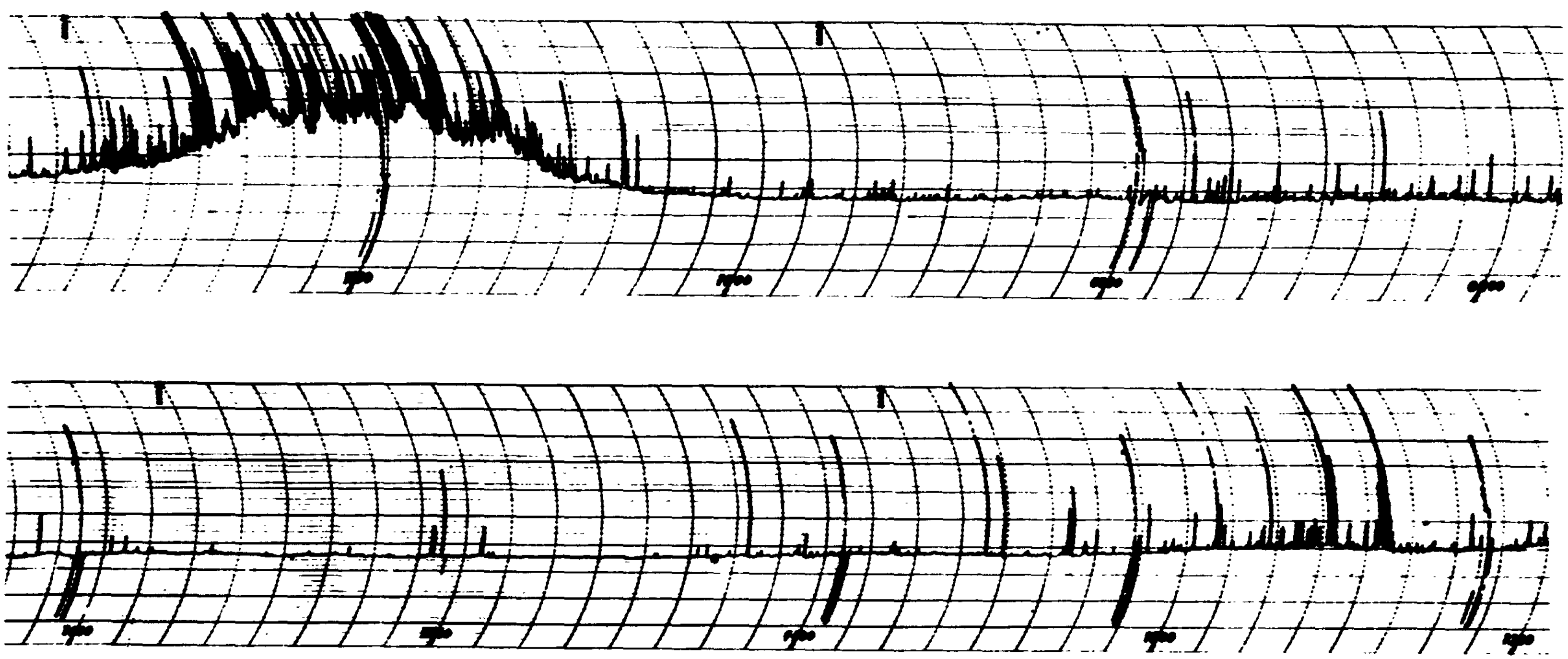
Peculiar variations in intensity may be due to solar, ionospheric or terrestrial (man-made) effects, and are tabulated as Pec . Only starting time and duration are tabulated.

4. POLARIZATION

When polarization measurements are available, the pertinent data are tabulated separately.

REFERENCES

[1] Boischot, A. (1958) - Ann. d'Astrophys. *21* , 333.



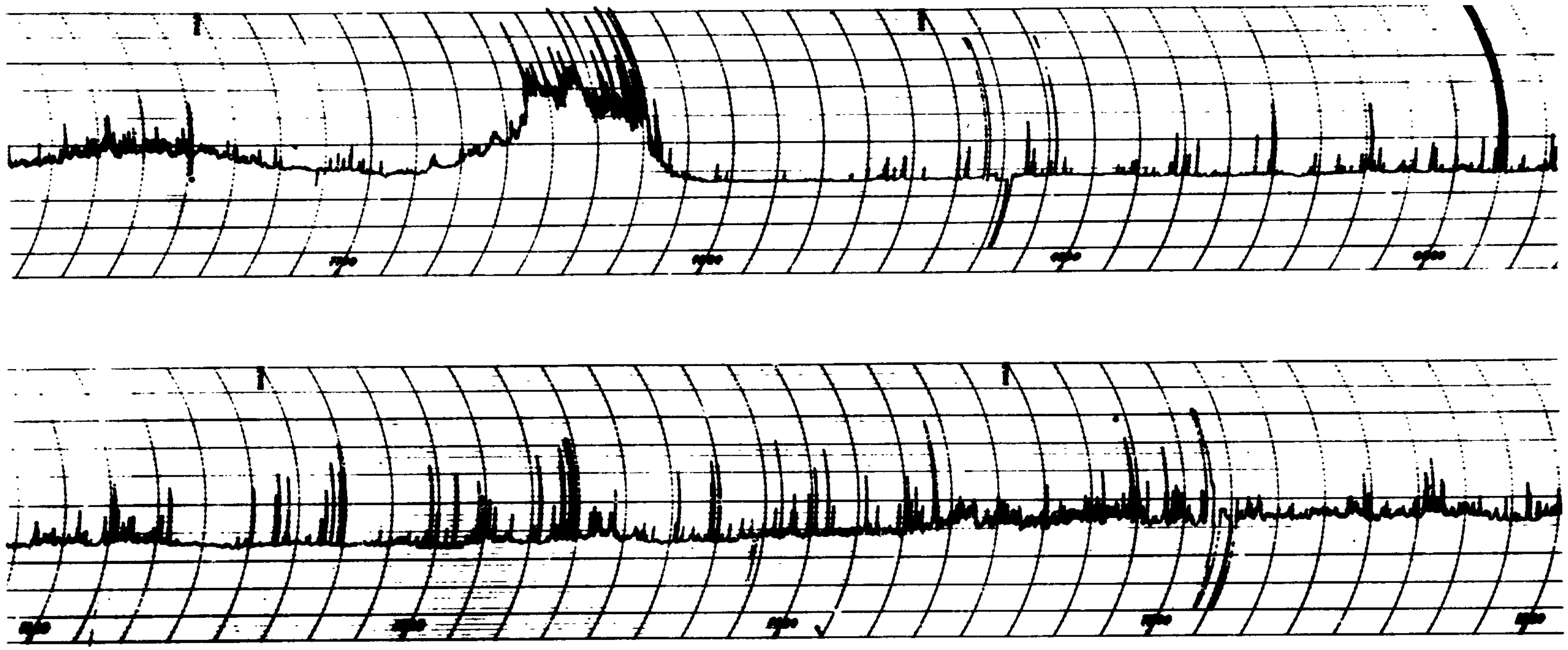
Daily data

UT	8–9	9–10	10–11	11–12	12–13	13–14	14–15	15–16
Flux density	11	10	13	18	12	11	10	10
Flux variation	1	1	3i	3d	1	1	0	0
Variability	0*	0	2	1	1G	0	0	0

Special Occurrences

Time Start	Time Max.	Dur. min.	Type	Intensity Max.	Intensity Smooth	Disturb. obs.	Remarks
1015		105	N2			1015-1200	
1226		1.5	BC				
1236			B				

Figure 7a. Example showing the tabulation of observations made June 12, 1958. Frequency 200 Mc/s.



Daily data

UT	8–9	9–10	10–11	11–12	12–13	13–14	14–15	15–16
Flux density	10	10	14	13	13	13	11	10
Flux variation	1	0	3id	2	1	2d	1	1
Variability	0*	0	1	0*	0*	0*	1	1

Special Occurrences

Time		Dur.	Type	Intensity		Disturb.	Remarks
Start	Max.	min.		Max.	Smooth	obs.	
0751.5		1.5	B				Double
1010		40	N2			1010-1050	Followed by enhanced rad.

Figure 7b. Example showing the tabulation of observations made June 19, 1958. Frequency 200 Mc/s.

SOLAR PHOTOGRAPHY IN Hα LIGHT, 1958-59

by

The Staff of the Institute

SOLAR PHOTOGRAPHY IN Hα LIGHT, 1958-59

ABSTRACT: An account is given of the solar photography program at the Solar Observatory at Harestua. The Zeiss Coudé refractor with Lyot monochromator and specially designed auxiliary equipment is described. An IGY expedition to Tromsö with the instrument yielded valuable material.

I. INTRODUCTION

A program for solar photography was started at the Solar Observatory at Harestua in 1956 with provisional equipment consisting of a Lyot Hα filter in conjunction with the coelostat of the solar tower and an old telescope objective lens. The assembly worked reasonably well, and some valuable material was obtained.

In August, 1957 the observatory acquired a Coudé refractor, expecially designed for this type of work by Carl Zeiss, Oberkochen. The instrument was first mounted in a small hut at Harestua (Figure 1), but in November, 1957 it was temporarily moved to Tromsö in Northern Norway for use during the spring and summer of 1958 as part of the Norwegian participation in the International Geophysical Year. The instrument was reinstalled at Harestua in October, 1958.

Fig. 1. Small observatory housing the Zeiss Coudé telescope of the Oslo Solar Observatory. The whole top of the construction turns to follow the sun.

2. THE INSTRUMENTS

The Zeiss Coudé refractor (Figure 2) has an apochromatic lens of aperture 150 mm and a focal length of 1650 mm.

In the declination axis a plane mirror reflects the light into the polar axis, where it may be switched towards the upper or lower end of the (hollow) axis by any one of two plane mirrors.

The Lyot filter is mounted at the upper end, in front of a Zeiss Contax 35 mm camera (Figure 3). The mirror used for obtaining Hα pictures is aluminized. At the lower end there is a Contax camera for photography in integrated light. The mirror used for this purpose is not aluminized, and reflects only 5 per cent of the incident light.

The three plane mirrors mentioned are all made of fused quartz.

Both cameras are mounted on rotating disks, along with eyepieces for visual observation. Arrangements are made for obtaining photometric squares and the exact time on each exposed frame of film.

The Lyot monochromator was acquired 11 years ago as No. 7 of a series made by Optique et Précision de Levallois S.A., Paris, under the personal supervision of Lyot. It may be operated in Hα, D_3 and the green corona line.

The funds for the telescope, apart from the monochromator, were obtained from the Norwegian Research Council (NAVF).

Fig. 2. Zeiss Coudé telescope used in the flare patrol program of the Oslo Solar Observatory.

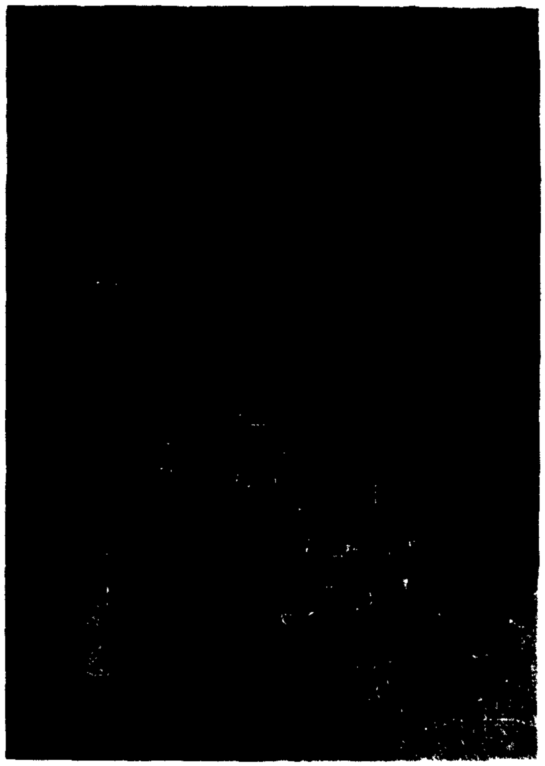


Fig. 3. Arrangement of camera and eyepiece for observing in Hα light with Coudé telescope. The upper part of the built-in Lyot filter is seen near the declination knob.

3. MODIFICATION OF INSTRUMENTS

The solar image formed by the Zeiss refractor has a diameter of 15 mm. In the experience of Dr. K.O. Kiepenheuer at the German Solar Station at Capri, however, a pre-focal, pre-exposure enlargement of the solar image is both advantageous and feasible. Hence an enlarging device of the Kiepenheuer type was constructed in our own shop. It was, moreover, desirable to replace the Contax with a camera of greater loading capacity. Both aims were satisfied by combining a Ross lens and a 35 mm Praktina camera with a holder for 55' of unexposed film. In addition to the manual control, the Praktina has an automatic device for exposures at time intervals of 20 seconds, and 1, 3 and 5 minutes.

This combination has usually been operated with a magnification of 4:3, which just permits the recording of the full image of the sun on standard film of 24 mm frame width, along with the clock dial, the date and the photometric wedge.

The magnification may be considerably increased by moving the camera and refocussing the Ross lens, but then only a section of the solar image is caught on the film.

A corresponding magnifying unit has been made for the lower end of the camera (integrated light). (Figure 4.) Preliminary tests with photometry of sunspots showed that images obtained in the primary focus of the instrument were unsuitable for detailed analysis of sunspot structure. The grain of the film was not sufficiently fine to show up the necessary details of the sunspots in question. The magnifying unit increases the linear dimension of the pre-exposure sunspot images by a factor of five (equivalent to a solar disk diameter of 75 mm). Images of 24 x 24 mm are recorded around sunspot groups on standard Agfa Isopan FF film.

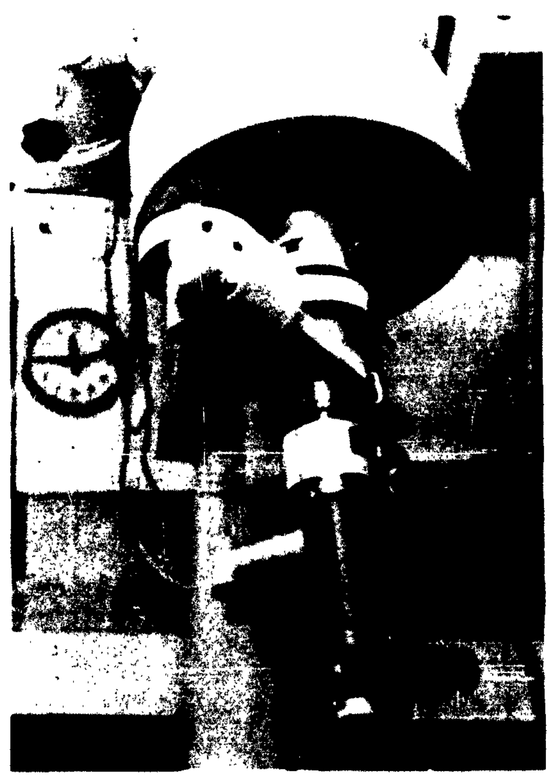


Fig. 4. Attachment for taking enlarged photographs of parts of the sun in integrated light with Coudé telescope.

4. IGY EXPEDITION

In November, 1957 the Zeiss Coudé refractor was taken to Tromsø (lat. 69°39'.8 N, long. 18°56'.9 E) and mounted in a small observatory belonging to the Aurora Observatory.

The expedition had two main purposes. Firstly, since Tromsø lies within the realm of the midnight sun unique results might be expected if phenomena developed during fair-weather periods of 24 hours or more. Secondly, it was aimed to find out whether Tromsø would be the best place for an arctic solar observatory, or if other sites in the North of Norway might be preferable.

On the latter score, the quality of seeing was poorer than we had hoped for at Tromsø, and so was the weather. Indications are that both conditions are considerably better further inland, and that an arctic observatory for solar research, if ever realized, should be built some distance east of Tromsø. This was suspected in advance, and Tromsø was in fact chosen as the site of the expedition for reasons of economy and ease of operation — lack of time and funds precluding the construction of a special house and other facilities further inland.

The Tromsø expedition obtained about 7,000 exposed frames of the sun in Hα light. Several long continuous strips were obtained early in the summer, but from July onward unfavorable weather hampered observational work. Observations were started on March 1, and the last exposure was made at the time of the September equinox.

Since the end of June, 1958, two extra negatives, one with a long and the other with a short exposure, are made every hour during observation periods and sent to the Fraunhofer Institute, Freiburg, West Germany.

5. OBSERVATIONS

On the following pages the times of observation of the sun under the flare patrol program are given in tabular form.

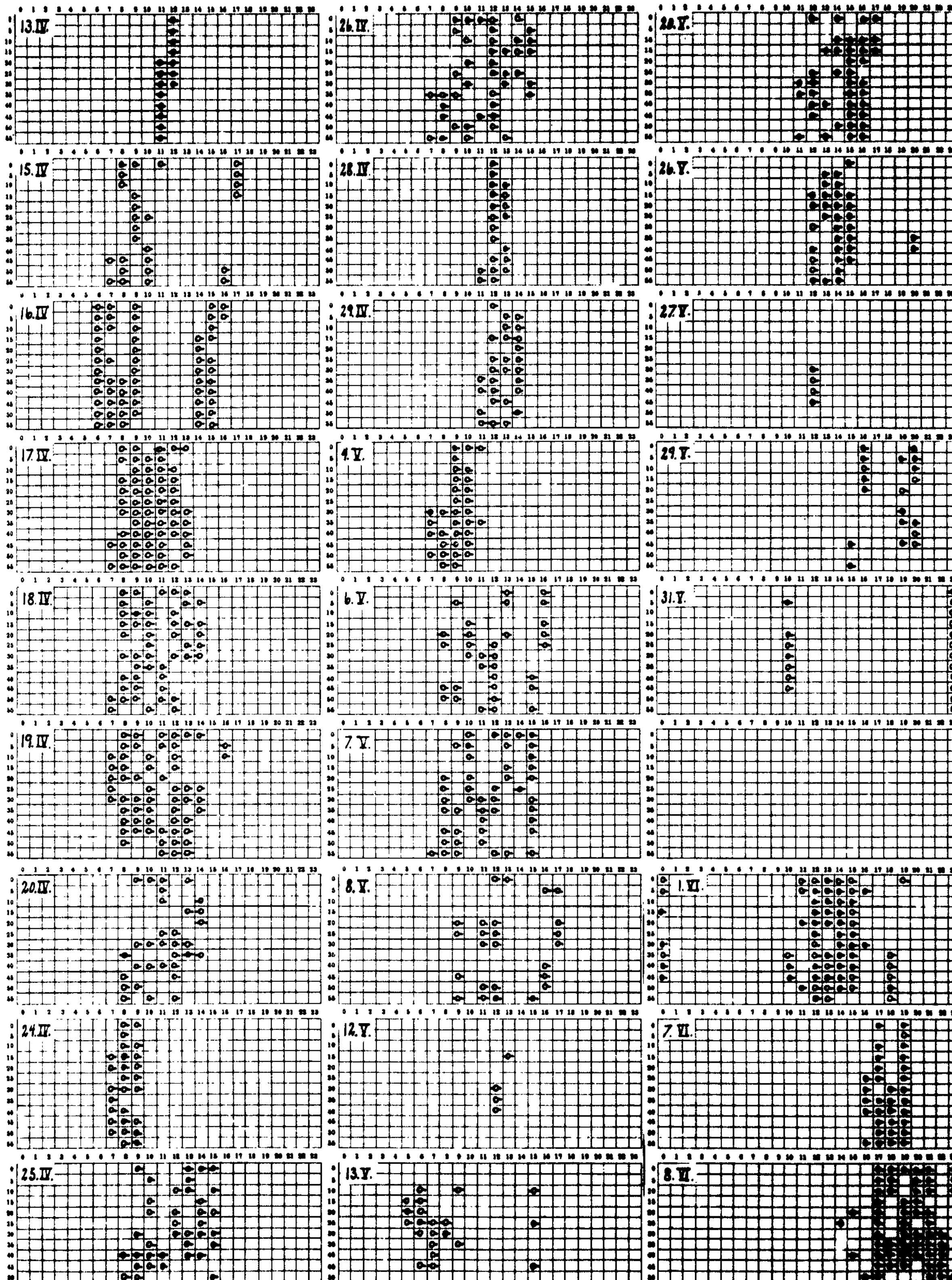
For the convenience of tabulation the day has been divided into five-minute intervals.

Two code signs are used:

-o denotes a long exposure to obtain photograph of prominences.

o- denotes short exposure for the solar disk.

One of the above signs may indicate more than one exposure during the appropriate five-minute interval.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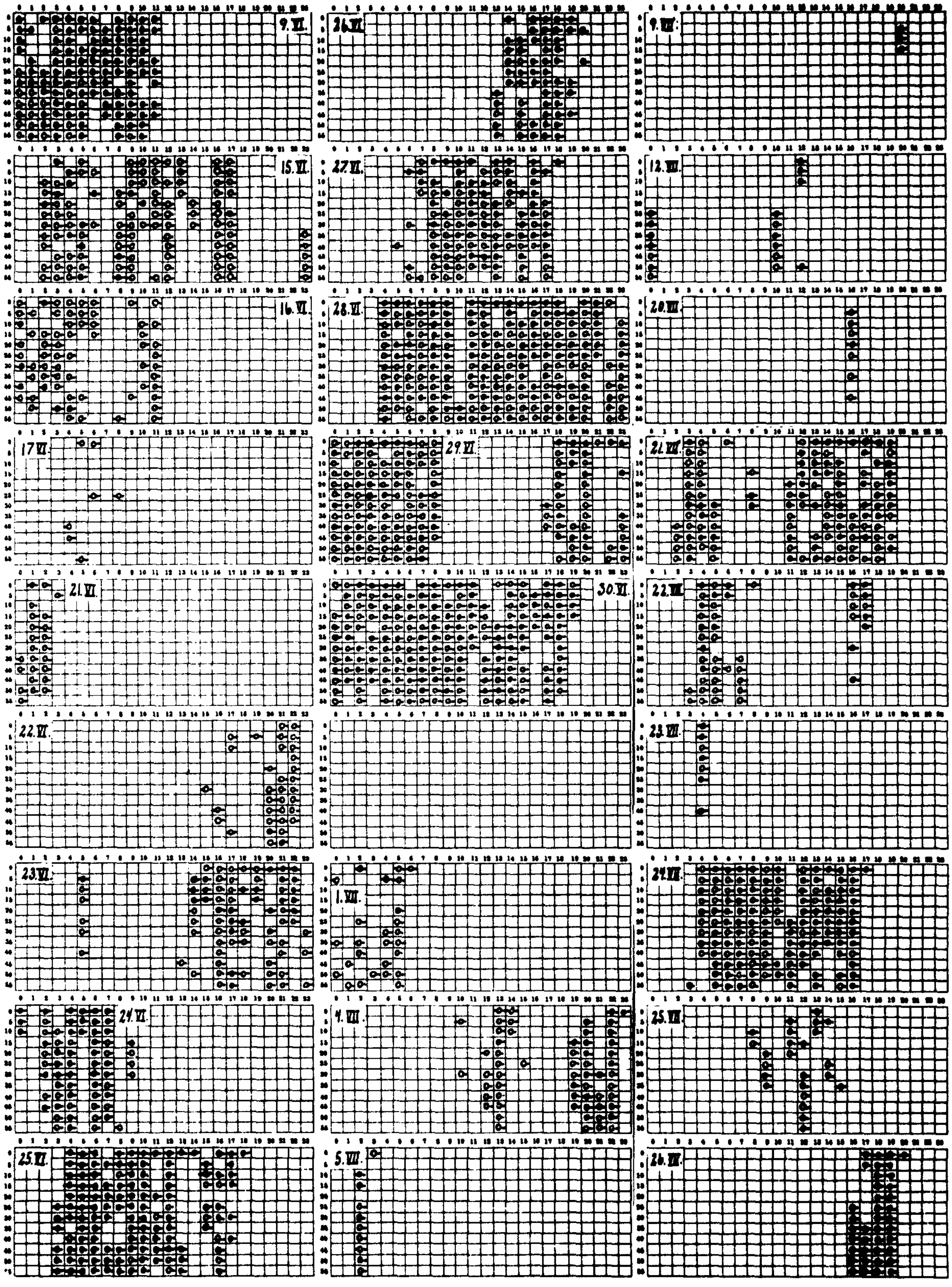
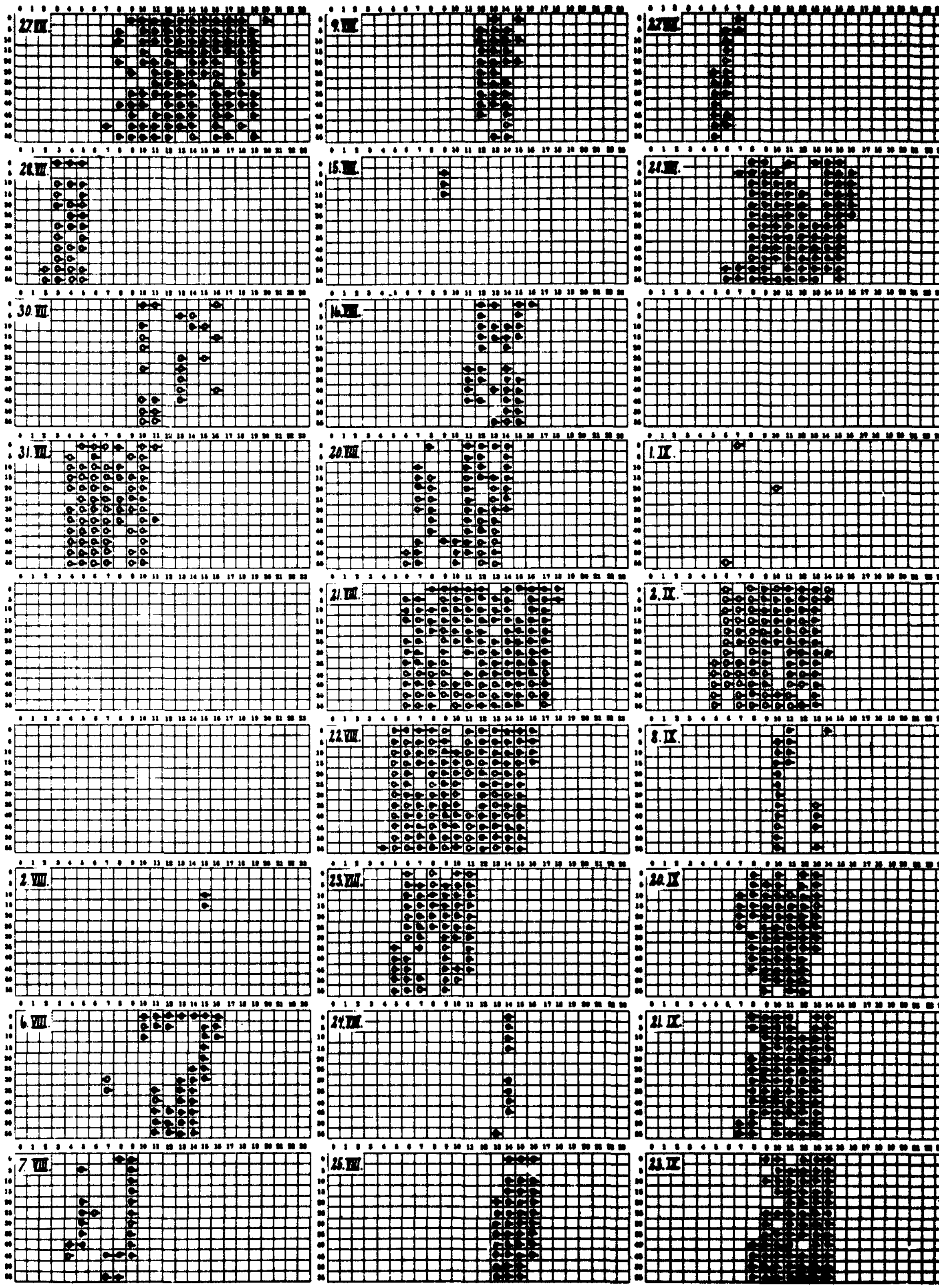
26.IV
15.IV
28.IV
26.V
16.IV
29.IV
27.V
17.IV
4.V
29.V
18.IV
6.V
31.V
19.IV
7.V
20.IV
8.V
1.VI
24.IV
12.V
7.VI
25.IV
13.V
8.VI

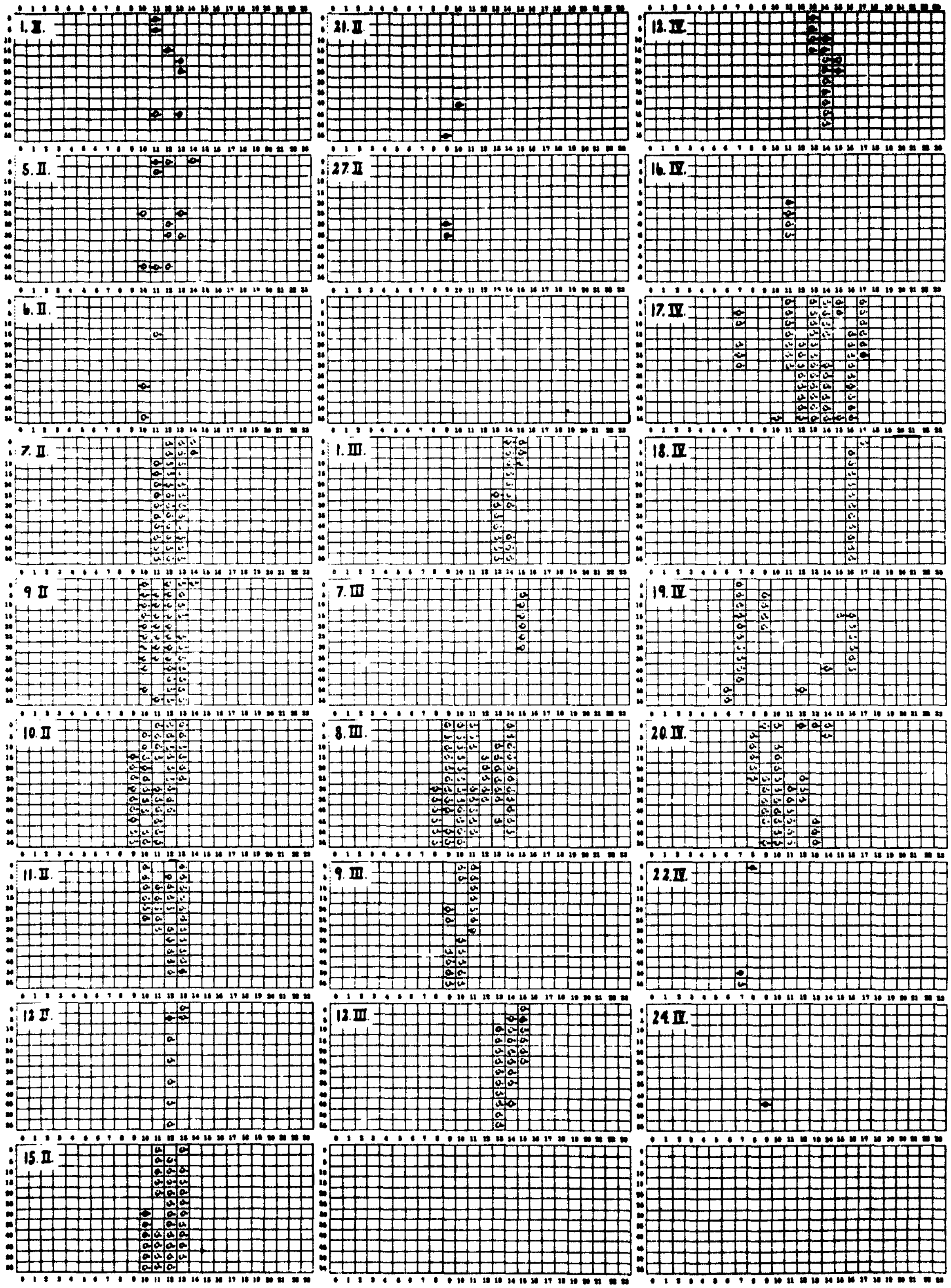
1958



1958


27.VII.
9.VIII.
27.VIII.
28.VII.
15.VIII.
28.VIII.
30.VII.
16.VIII.
31.VII.
20.VIII.
1.IX.
21.VIII.
2.IX.
22.VIII.
8.IX.
2.VIII.
23.VIII.
20.IX.
6.VIII.
24.VIII.
21.IX.
7.VIII.
25.VIII.
23.IX.

1958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9 II
7.III
19.IV
10 II
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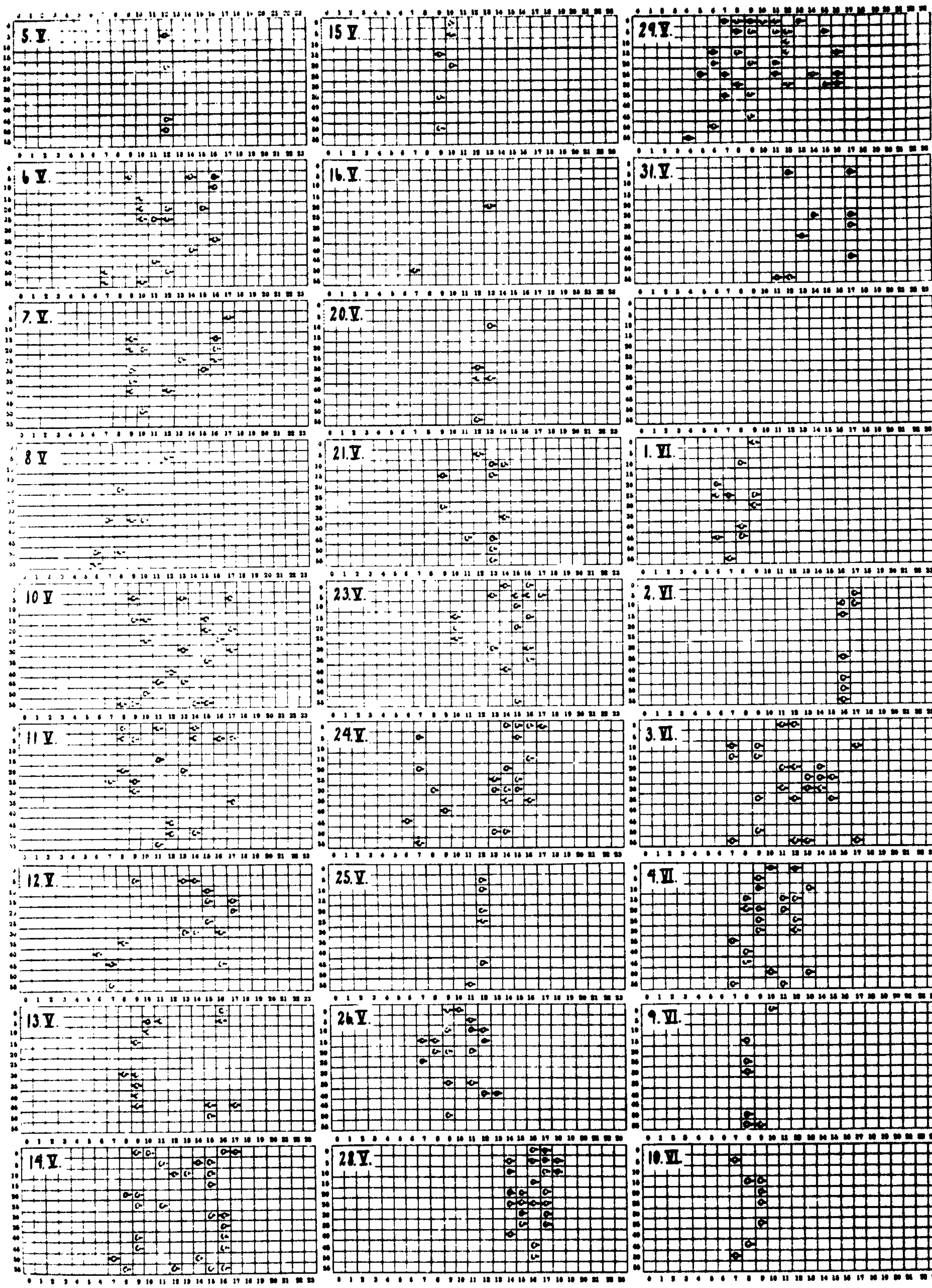
9.III.
22.IV.
12 II.
12.III.
24.IV.
15.II.

1959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6 V.
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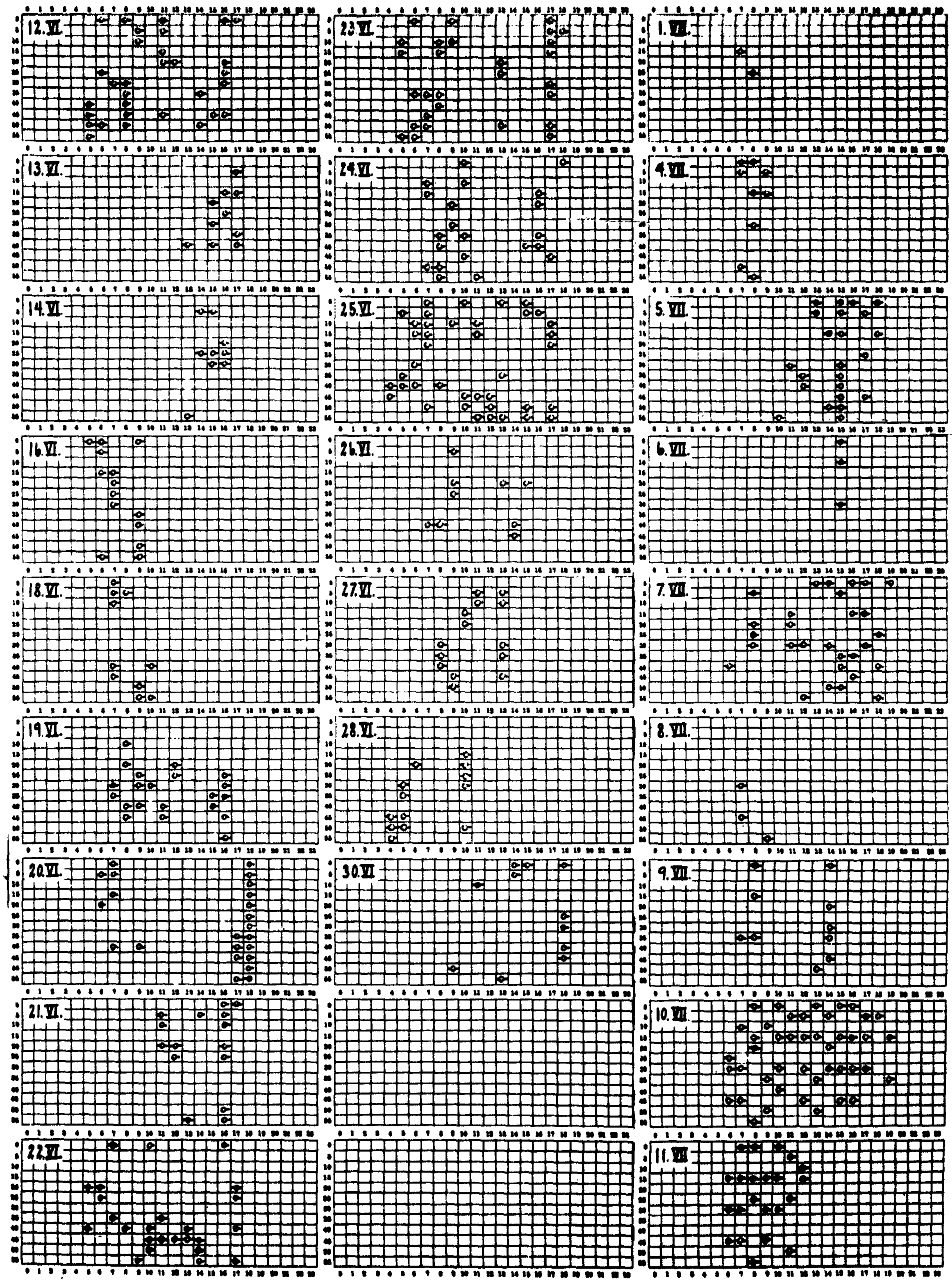
31. V.
7. V.
20. V.
8 V
21. V.
1. VI.
10 V
23. V.
2. VI.
11 V.
24. V.
3. VI.
12. V.
25. V.
4. VI.
13. V.
26. V.
9. VI.
14. V.
28. V.
10. VI.

1959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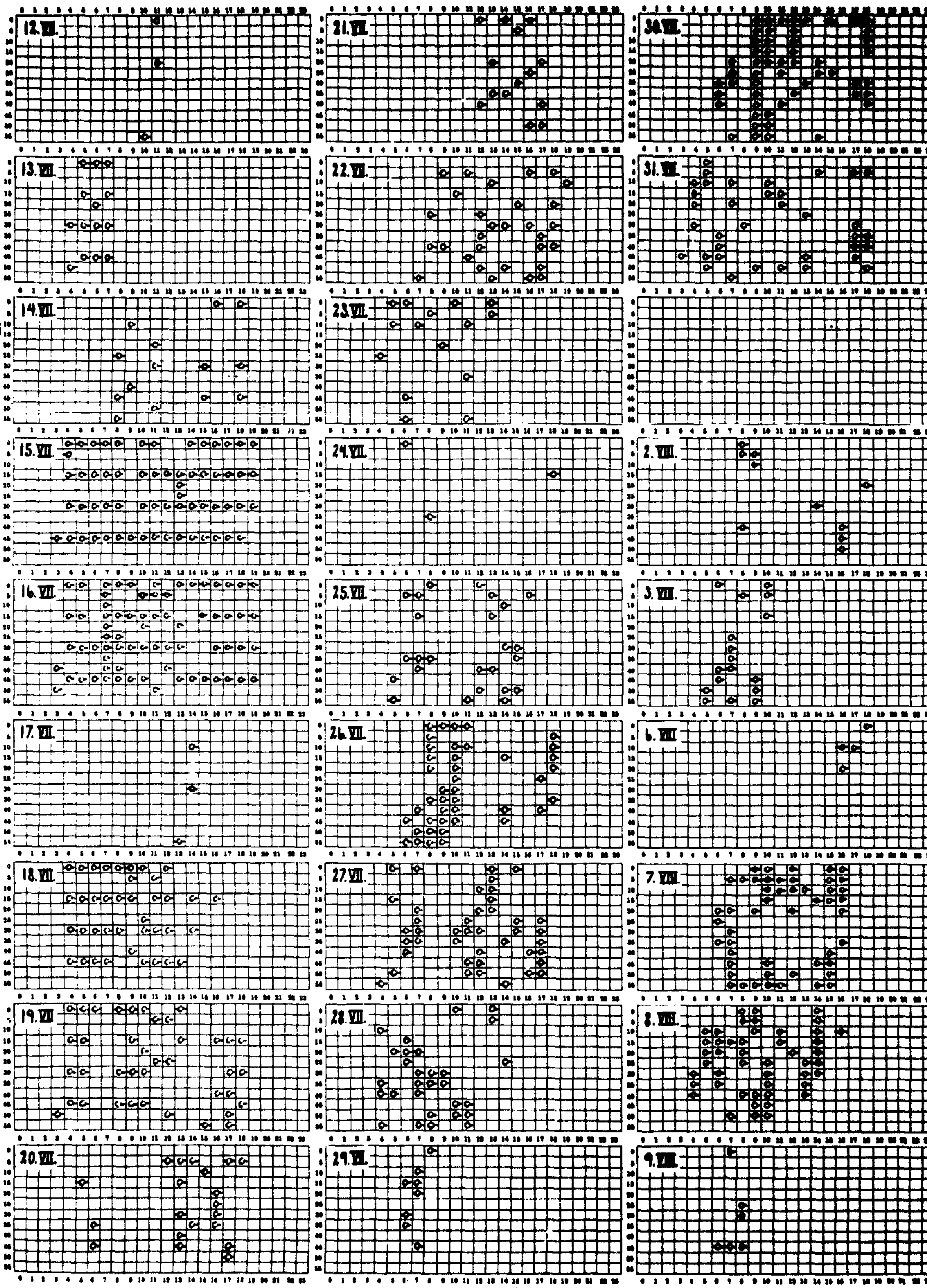
11.VII.

1959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7. VIII.
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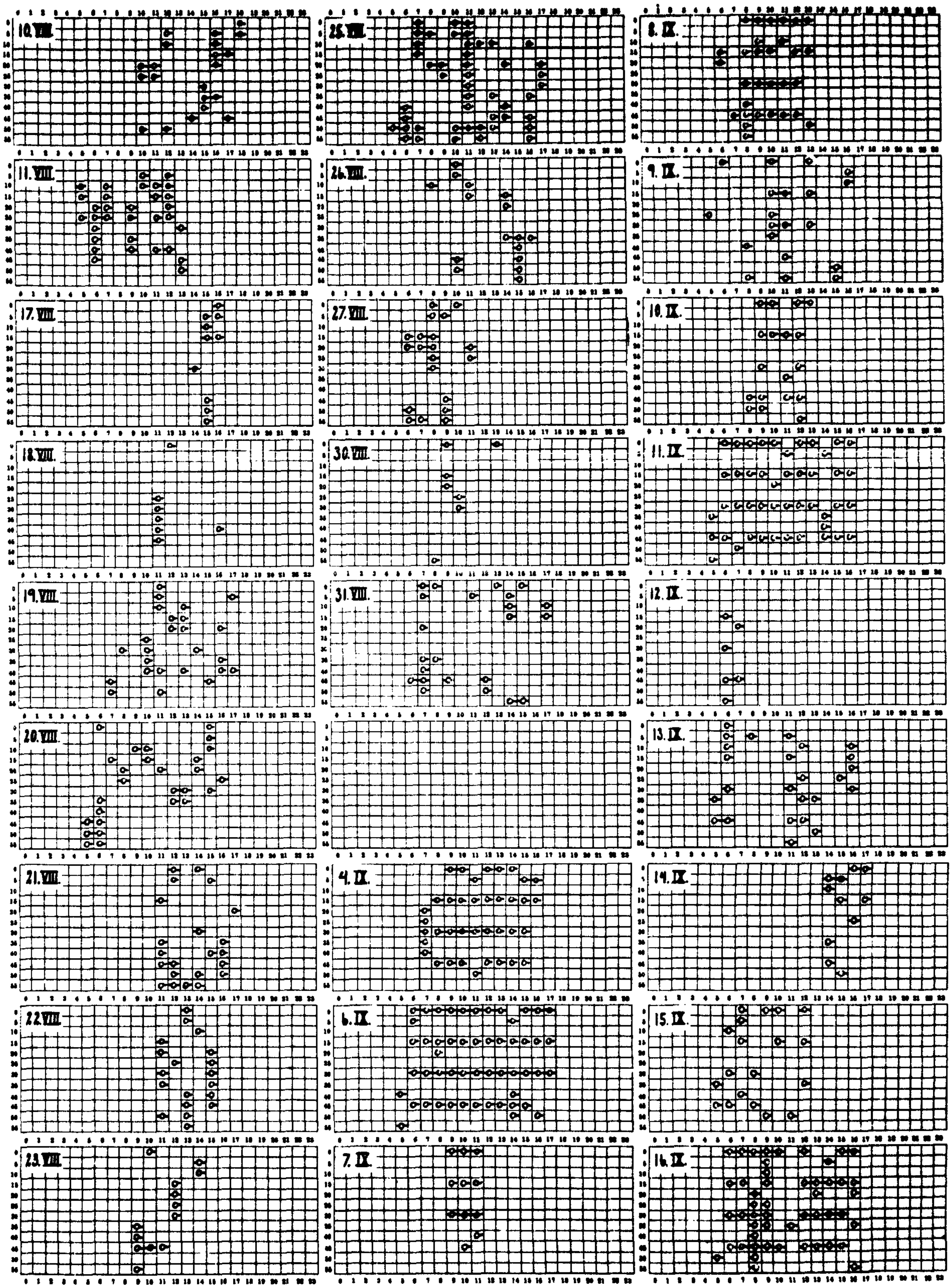
8. VIII.
20. VII.
29. VII.
9. VIII.

1959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19.VIII.
31.VIII.
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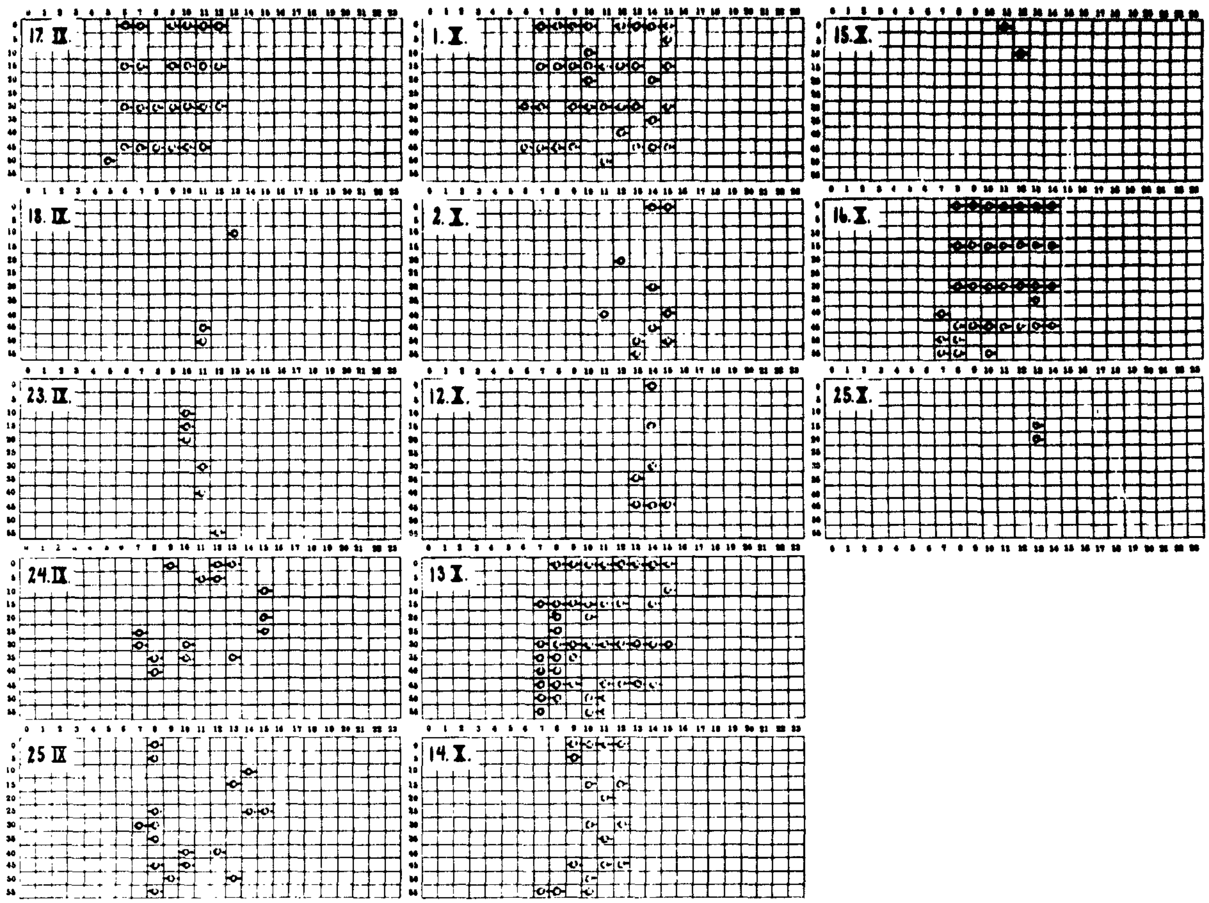
23.VIII.
7.IX.
16.IX.

1959



1959

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United States Air Force, Air Research and Development Command, European Office, Brussels, Belgium.
Scientific Report No. 10:

I. SOLAR RADIO NOISE REGISTRATIONS ON 200 Mc/s, 1958-59, by the Staff of the Institute.
II. THE 200 Mc/s RADIO TELESCOPE OF THE SOLAR OBSERVATORY, by Gunnar Eriksen.
III. FREQUENCY SPECTRA OF SOLAR NOISE STORM BURSTS IN THE 200 Mc/s RANGE, by Øystein Elgarøy.
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